AN OVERVIEW OF THE FEDERAL R&D BUDGET FOR FISCAL YEAR 2006

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED NINTH CONGRESS

FIRST SESSION

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February 16, 2005

AN OVERVIEW OF THE FEDERAL R&D BUDGET FOR FISCAL YEAR 2006

WEDNESDAY, FEBRUARY 16, 2005

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 11:00 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert [Chairman of the Committee] presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

An Overview of the Federal R&D Budget for Fiscal Year 2006

Wednesday, February 16, 2005
11:00 a.m. – 1:00 p.m.
2318 Rayburn House Office Building (WEBCAST)

Witness List

Dr. John H. Marburger III
Director
Office of Science and Technology Policy

Dr. Samuel W. Bodman
Secretary of Energy

Dr. Arden Bement
Director
National Science Foundation

Mr. Theodore W. Kassinger
Deputy Secretary of Commerce

Dr. Charles E. McQueary
Under Secretary for Science and Technology
Department of Homeland Security

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HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

An Overview of the Federal R&D Budget for Fiscal Year 2006

WEDNESDAY, FEBRUARY 16, 2005
11:00 A.M.–1:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, February 16, 2005, the House Science Committee will hold a hearing to consider President Bush's fiscal year 2006 (FY06) budget request for research and development (R&D). Five Administration witnesses will review the proposed budget in the context of the President's overall priorities in science and technology. The Science Committee will hold a separate hearing on February 17th to examine the budget request for the National Aeronautics and Space Administration (NASA).

2. Witnesses

Dr. John H. Marburger, III is Director of the Office of Science and Technology Policy (OSTP), the White House science office. Prior to joining OSTP, Dr. Marburger served as President of the State University of New York at Stony Brook and as Director of the Brookhaven National Laboratory.

Dr. Samuel W. Bodman is Secretary of the Department of Energy (DOE). Prior to joining DOE, Secretary Bodman served as Deputy Secretary of the Treasury and, before that, Deputy Secretary of the Department of Commerce (DOC). He also has served in executive positions in several publicly owned corporations, and as a professor of chemical engineering at the Massachusetts Institute of Technology.

Dr. Arden Bement is the Director of the National Science Foundation (NSF). Prior to his appointment as NSF Director, Dr. Bement was Director of the National Institute of Standards and Technology (NIST) and before that he was Professor and head of the School of Nuclear Engineering at Purdue University.

Mr. Theodore W. Kassinger is the Deputy Secretary of the Department of Commerce. Previously, Mr. Kassinger served as the General Counsel of the Department.

Dr. Charles E. McQueary is the Under Secretary for Science and Technology (S&T) at the Department of Homeland Security (DHS). Prior to joining the Department, Dr. McQueary served as President of General Dynamics Advanced Technology Systems, and as President and Vice President of business units for AT&T, Lucent Technologies, and as a Director for AT&T Bell Laboratories.

3. Background

Overall Budget

On February 7, 2005, President Bush delivered his FY06 federal budget to Congress. Overall discretionary spending is increased by 2.1 percent—roughly equivalent to projected inflation. Consistent with budgets of recent years, discretionary account increases are focused heavily on Department of Defense (DOD) and Department of Homeland Security (DHS) activities, which grow by just under five and seven percent, respectively. Non-defense, non-homeland security discretionary spending is reduced by nearly one percent.

Research and Development (R&D) Budget

The President's R&D budget proposes to spend $132.3 billion, an increase of $733 million, or one percent, over FY05.[1] The largest increases for R&D go to the National Aeronautics and Space Administration (NASA, $537 million, or 4.8 percent), DOD ($417 million, or 0.06 percent), and DHS ($282 million, or 23.8 percent). All

[1] A complete federal R&D spending table is provided at the end of the charter in Appendix II.

other agencies collectively receive an average decrease of 1.0 percent. The one percent R&D growth reflects increases in development ($1.2 billion, or two percent).[2] Applied research ($3 million, or 0.0 percent) and basic research (−$320 million, or −1.2 percent) are flat and slightly lower, respectively.

Science and Technology Budget

The Federal Science and Technology (FS&T) budget is a way of presenting the budget that was recommended by the National Academy of Sciences; it focuses on spending for actual research by excluding areas such as defense development, testing, and evaluation. In the FY06 budget, funding for FS&T declines by 1.4 percent, to $60.8 billion. The FS&T budgets of DOC and DOE are particularly affected, receiving 14 percent and five percent cuts, respectively.

Administration Highlights and Perspective

Consistent with the President's overall budget priorities, the request for R&D focuses on homeland security and defense spending while limiting the growth in overall spending. The Administration argues that science, technology, and innovation are given relative priority in the budget, noting that non-defense budget authority declines by 0.26 percent, while non-defense R&D budget authority is increased by 0.74 percent.

The Administration also emphasizes several ways of looking at the R&D budget that go beyond year-to-year proposals. For example, the budget notes that in FY06, 13.6 percent of total discretionary outlays will go to R&D, the highest share since 1968 and the heyday of the Apollo program. The budget also compares the request level for many agencies and programs to FY01, underscoring the fact that overall R&D has increased 45 percent since 2001 (an annualized rate of 7.7 percent), and funding for NSF and NASA have increased by 25 and 19 percent, respectively, since FY01.

Critics counter that figures based on R&D do not give a clear picture of what has been happening to research because the category is so weighted toward development. They also point out that even in the research category some agencies have done far better than others. DOD alone accounts for almost 70 percent of R&D increases over the last five years, and the National Institutes of Health (NIH) and DHS account for almost 75 percent of the remaining civilian R&D increases. During that same period, trends at other agencies range from modest increases (DOE: 10 percent, and that includes defense development programs) to modest cuts (DOC: -4 percent; EPA: -5 percent). Critics also note that the figures that start in FY01 are based on final appropriations, which reflect Congressional as well as Administration actions. Similarly, critics note that the figures that start with FY01 include Congressional earmarks, which for other purposes (see below), the Administration backs out of its baseline spending figures.

For a number of science agencies (perhaps most notably the National Oceanic and Atmospheric Administration, or NOAA), the Administration argues that it is proposing significant programmatic increases even though the total proposed for FY06 is below that for FY05. That is because the FY05 number includes numerous Congressional earmarks for specific grants. The Administration argues that the earmarks should be removed from the FY05 baseline to get a truer picture of what is being proposed. The budget document reflects the Administration's continued and growing concern over Congressional earmarks within R&D accounts. The budget cites a study by the American Association for the Advancement of Science that calculated that earmarks for R&D at academic institutions increased by nine percent from 2004 to 2005, and now total over $2.1 billion—up from $296 million only ten years ago. The *Chronicle of Higher Education* has estimated that R&D earmarks now account for eight percent of all federal funding to colleges and universities.

The Administration also emphasizes that evaluations of agency and program management are considered in determining proposed budgets. Agencies are evaluated by the Executive Branch Management Scorecard, which rates agencies with green, yellow, and red lights in areas such as financial management, e-government, and human capital management. Agencies under the Science Committee's jurisdiction scored very well on these evaluations. Of the 26 agencies evaluated, DOE, NASA, and NSF were three of only seven to receive three or more green lights.

4. Primary Issues

Here are some key questions raised by the FY06 budget request along with relevant background:

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[2] Defense development is by far the largest factor in the overall R&D increase, accounting for $1.4 billion in added spending.

Overall Funding Levels and Balance

Regardless of how science fares in the proposed FY06 budget in comparison with other program areas, the figures are unarguably quite tight and are projected to remain so for several years. *What would the impact of such austerity be on the research agenda, on U.S. leadership in science and technology, on the production of future scientists and engineers?* The budget also would do little to increase the relative strength of research in the physical sciences, which have fallen far behind the biological sciences as a percentage of the federal research budget. Increasing the relative strength of the physical sciences has been a priority of the scientific community (including the President's Council of Advisors on Science and Technology, or PCAST) and of the Congress, as reflected in several Science Committee bills that have been signed into law in the past four years, including the *NSF Authorization Act of 2002,* the *21st Century Nanotechnology Research and Development Act,* and the *Cyber Security Research and Development Act.* All of those laws authorize significantly more for the physical sciences than has been provided in appropriations or in the FY06 request.

Basic Research at the Department of Energy

The debate over the relative strength of the physical sciences often focuses on funding for the Department of Energy (DOE) Office of Science, which is a major source of funding for the physical sciences. Congress last year provided an increase of almost four percent for the Office—the first significant growth in many years—but the FY06 budget would reduce funding for the Office by almost four percent (or by about two percent if earmarks are removed from the FY05 baseline). The impact on grants to individual researchers would be far larger, perhaps as great as a 10 percent cut, because so much of the Office's budget is spent on the costs of large user facilities run by the National Laboratories. *How high a priority should research at the Office of Science be in the President's budget?* The Office of Science has not fared well in budget requests compared to the National Science Foundation, which is in many ways a "sister agency" that focuses on basic research.

Applied Energy Research

Funding for applied research in the FY06 budget is focused on a few long-range initiatives, such as the President's hydrogen initiative. Excluding the hydrogen/FreedomCAR activities, energy efficiency and renewable energy R&D for FY06 would be cut by 11 percent, to $687 million. *Does the budget appropriately balance funding for technologies that could be deployed in the nearer-term with research on long-run advances like hydrogen?* The budget also proposes the elimination of DOE's oil and gas R&D, which have been rated as "ineffective" by the Office of Management and Budget. *Is the elimination of these programs warranted?*

NSF Education Funding

The FY06 budget request cuts the Education and Human Resources (EHR) account at NSF by 12 percent (and by 22 percent below the FY04 level of $938 million). NSF has indicated that the reductions in elementary, secondary and undergraduate education are part of a conscious policy to significantly pare its role in program implementation, allowing these to migrate to the U.S. Department of Education. *Should NSF continue to play a significant role in science and math education at all levels of schooling?*

Technology Programs at the National Institute of Standards and Technology (NIST)

While the internal laboratories at NIST are slated to receive a 12 percent increase in the FY06 budget proposal, the President proposes to eliminate the Advanced Technology Program (ATP) and to halve the budget for the Manufacturing Extension Partnership program (MEP). Both programs were created by Congress in 1988. ATP, long a source of controversy, provides grants to companies for pre-competitive research. MEP runs centers, partly funded by states, throughout the country to help smaller manufacturers take advantage of the latest technology. Last year, the budget proposed to eliminate MEP, but the Administration later retreated from the proposal. *Should ATP and/or MEP be eliminated? How high a priority are they compared to other activities at NIST?*

5. Interagency Research Activities

The Administration has not proposed any new interagency R&D initiatives for FY06.

National Nanotechnology Initiative (NNI): NNI, interagency program that coordinates federal support for nanoscale R&D, continues to be a high priority of both the Administration and the Science Committee. Between FY01 and FY05, spending

on federal nanotechnology R&D more than doubled, rising from $464 million in FY01 to $1.1 billion in FY05. The FY06 budget requests an estimated $1.05 billion for the program in FY06, a decrease of $27 million, or 2.5 percent, from the estimated FY05 level.[3] Requested funding for the five agencies[4] authorized in the *21st Century Nanotechnology Research and Development Act* (P.L. 108–153) is $666 million, which remains well below the $890 million authorized for these agencies for FY06 in the Act.

Networking and Information Technology R&D (NITRD): NITRD is described as a "collaborative effort of many federal agencies [and] the Nation's principal source of long-term, fundamental information technology (IT) R&D, including advanced technologies in high-end computing systems and software, high-speed networking, software assurance and reliability, human-computer interaction, and information management." For the fourth straight year, the budget request does not include an increase for NITRD. This year, the request is $2.2 billion, a 4.5 percent decrease below the estimated FY05 level. A significant part of this decrease is due to a reduction in funding at NASA, which is redirecting funds from a number of programs to better support the President's vision for space exploration. Within NITRD, the work on High End Computing R&D is down six percent, due in part to a drop in funding in this area at DOE Office of Science.

Cyber Security R&D: Proposed funding for cyber security R&D programs remains flat. At NSF, the budget requests $67.5 million for cyber security R&D (up two percent), but proposes cutting funding for cyber security-focused education programs (down 27 percent to $12 million). At NIST, the request is $19 million for cyber security R&D (the same level as in FY05). All of these proposed funding levels are significantly below the levels authorized in the *Cyber Security Research and Development Act* (P.L. 107–305).[5] Within the DHS Science and Technology (S&T) Directorate, the FY06 budget requests $16.7 million for cyber security R&D, down seven percent from the FY05 level.[6]

Climate Change Research: The FY06 budget requests $1.9 billion for the interagency Climate Change Science Program (CCSP), about the same level as enacted in FY05. There is a $100 million (eight percent) decrease in NASA's contribution to CCSP, offset primarily by a $57 million (46 percent) increase in NOAA and a $15 million (21 percent) increase in USDA's contributions to the program. The request for CCSP includes $183 million for the interagency Climate Change Research Initiative (CCRI), a 17 percent decrease above the FY05 enacted level. It is unclear why CCRI was reduced when these activities have been a high priority for the Administration in past years. CCRI is intended to target critical scientific uncertainties and deliver results in three to five years.

The National Earthquake Hazard Reduction Program (NEHRP): NEHRP is an interagency effort aimed at reducing earthquake hazards through activities such as seismic and engineering research, earthquake monitoring, and code development and adoption. It includes NIST, NSF, the U.S. Geological Survey (USGS), and the Federal Emergency Management Agency (FEMA). The complete NEHRP budget for FY06 has not yet been provided to the Committee. However, the NSF request is $53.98 million, roughly flat compared to FY05, and USGS receives $51.34 million, up from $46.89 million in FY05. Included in the USGS NEHRP budget is $8.2 million for the Advanced National Seismic System (ANSS). In FY05, NIST and FEMA were funded at $1.8 and $20.5 million, respectively. The Committee remains concerned that NIST NEHRP funding will not be sufficient to carry out its new responsibilities as the lead agency for NEHRP.

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[3] The budget estimates agency funding levels for the National Nanotechnology R&D Program activities, but the data are not entirely consistent from year to year. This is in part because discrepancies arise due to the fact that some nanotechnology research is difficult to identify or classify.

[4] The five agencies authorized by the Act are: NSF, DOE, NASA, EPA, and NIST. The total funding authorized by the Act for these agencies is $3.7 billion over four years.

[5] For FY06, NSF cyber security programs are authorized at $134 million and NIST cyber security programs are authorized at $77 million.

[6] DHS also supports operational cyber security programs, such as national alerts about existing computer and network vulnerabilities. Located in the National Cyber Security Division of the Information Analysis and Infrastructure Protection Directorate, operational cyber security receives roughly $73 million (a $6 million increase) in FY06.

6. Agency R&D Highlights

Department of Energy (DOE)

The FY06 request for civilian R&D at DOE of $5.4 billion represents a decrease of five percent from FY05 enacted levels. The Administration's top funding priorities for energy science programs are hydrogen R&D, operating funds for scientific user facilities, and fusion research.

Office of Science

The budget proposes cutting funds for the Office of Science by $137 million (-4 percent), to $3.46 billion. The budget request indicates a higher priority for operating funds for scientific user facilities. The request includes double digit funding for the operations of new facilities such as the Spallation Neutron Source (+$74 million) at Oak Ridge National Laboratory and four new Nanoscale Science Research Centers (+$43 million), and a 10 percent cut for funding for research grants.

The budget proposes to cancel plans for the physics facility at the Fermi National Laboratory known as BTev. BTev was one of 20 facilities included in the Office of Science 20-year facilities plan released last year. A DOE scientific advisory panel recommended that if the project was not initiated by 2008, it should be canceled in favor of other pending large facilities proposals. The budget request no funds for construction of the Rare Isotope Accelerator (RIA), a nuclear physics facility accorded relatively high priority in the 20-year facilities plan. The budget requests $4 million for RIA-related R&D in FY06. (A site for RIA has not been selected; Argonne National Laboratory and Michigan State University are the finalists.)

The request for fusion R&D is up $17 million overall, (+6 percent, to $291 million) with funding for ITER (an international partnership to build a large-scale fusion reactor) up $51 million (+113 percent to $56 million), although site negotiations have been stalled for more than a year as France and Japan compete to host the project. The large increase for ITER could result in reduced funding for basic fusion research and curtailed operating time on existing fusion facilities in the U.S.

In other program changes, the budget proposes a $126 million reduction in funding for Biological and Environmental Sciences (−22 percent to $456 million) with proposed cuts targeted primarily in the Medical Applications and Measurement area that hosts numerous Congressional earmarks. The budget also proposes a $25 million reduction for Advanced Scientific Computing (−11 percent to $207 million). On the other hand, the budget proposes a $20 million increase (+28 percent to $87 million) for Genomics.

Applied Energy Programs

The FY06 budget proposes reduced funding for energy efficiency and renewable energy (EERE) R&D programs while increasing funds for hydrogen R&D. Overall funding for EERE R&D activities is cut $54 million (−5 percent to $975 million) but, if the hydrogen/FreedomCAR activities are excluded, energy efficiency and renewable energy R&D is cut by 11 percent ($79 million), to $687 million, from the FY05 enacted level of $766 million.

In specific EERE programs, significant cuts were requested for Building Technologies (−12 percent , −$8 million to $58 million), Industrial Technologies (−25 percent, −$18 million to $57 million), and the Biomass program (−18 percent, −$16 million, to $72 million).

In fossil energy, overall funding is cut $80 million (−14 percent to $491 million). DOE proposes to eliminate oil and gas technology research, allocating $10 million to each program for orderly termination of ongoing activities. Both these programs were scored "Ineffective" by OMB for the last two years. The stationary fuel cell program (Distributed Generation), is cut by $12 million (−16 percent to $65 million). In coal programs, there is an overall increase of $13 million (+4.9 percent to $286 million), with shifts in programmatic emphasis. Carbon Sequestration gets a requested increase of $22 million (+48 percent to $67 million) while the coal-based fuels program is cut $10 million (−31 percent to $22 million) and Advanced Research is cut $10 million (−28 percent to $31 million). FutureGen, the proposed $1 billion dollar project to build a zero-emissions coal plant, is funded at $18 million, the same as last year's appropriation.

In the nuclear area, funding for civilian activities in Nuclear Energy is up $15 million, (+4 percent to $389 million). In the research and development programs, Nuclear Power 2010 is up $6 million (+13 percent to $56 million), Generation IV is up $5 million (+13 percent to $45 million) and Nuclear Hydrogen up $11 million (+124 percent to $20 million). The Nuclear Energy Plant Optimization program and the Nuclear Energy Research Initiative are not funded.

The Office of Electric Transmission and Distribution and Energy Assurance receives a $25 million decrease (−20 percent to $96 million), with the majority of the cut (−$20 million) coming from R&D programs.

Issues/Questions Raised by the FY06 Request for DOE

Hydrogen R&D: The budget requests a significant increase for R&D for hydrogen as a fuel for transportation, while reducing funds for energy efficiency and renewable energy R&D. In addition to questions raised at the front of this charter, the focus on hydrogen raises an additional question. Hydrogen must be produced from other energy sources, so if renewable energy research is not well supported, it may not be possible to produce hydrogen in the quantities necessary for transportation without relying on imported energy.

Facilities vs. Research Grants: Traditionally DOE has maintained a balance between research grants and laboratory activities. Since DOE is the leading source of civilian physical sciences research funding, as well as a large portion of other civilian basic research, the reduction of grants to enable user facilities to continue to operate raises a fundamental question about the role of the Office of Science. Should the Department focus on providing the large-scale equipment and facilities that scientists need and leave the funding of individual experiments to others (whether inside or outside government), or should the department strive to have a mix of both research grants and facilities accessible to users?

Table 1.

Department of Energy Civilian R&D
FY 2006 Budget Request (dollars in millions)
(Source: Department budget justification)

Account	FY04 Enacted	FY05 Request	FY05 Approps	FY06 Request	FY05-06 change	FY05-06 percent
Science	3523	3432	3600	3463	-137	-4%
HEP	716	737	736	714	-22	-3%
NP	380	401	405	371	-34	-8%
BER	624	502	582	456	-126	-22%
BES	991	1064	1105	1146	41	4%
ASCR	197	204	232	207	-25	-11%
FES	256	264	274	291	17	6%
Other (1)	359	260	266	279	13	5%
FE R&D	659	636	572	491	-81	-14%
EERE R&D	1003	960	1023	975	-48	-5%
EE	651	585	643	621	-22	-3%
RE	352	375	380	354	-26	-7%
NE	327	388	375	390	15	4%
ETD	101	102	119	96	-23	-19%
Total	5613	5518	5689	5415	-274	-5%

(1) Other includes program direction, laboratories infrastructure, and other activities.
(2) R&D programs only - not including accounting changes for clean coal
(3) Does not include non-civilian nuclear activities

Key to Abbreviations

Science	
HEP	High Energy Physics
NP	Nuclear Physics
BER	Biological and Environmental Research
BES	Basic Energy Sciences
ASCR	Advanced Scientific Computing Research
FES	Fusion Energy Science
FE	Fossil Energy (in Energy Conservation for now)
FERD	Fossil Energy Research and Development Account
EERE	Office of Energy Efficiency and Renewable Energy
RE	Renewable Energy (in Energy Supply account)
EE	Energy Efficiency (in Energy Conservation account for now)
NE	Nuclear Energy Science and Technology (in Energy Supply account)
ETD	Electric Transmission and Distribution

National Science Foundation (NSF)

The National Science Foundation is the primary source of federal funding for non-medical basic research conducted at colleges and universities and serves as a catalyst for science, technology, engineering, and mathematics education reform at all levels.

The FY06 budget request for NSF is $5.61 billion, an increase of 2.4 percent, or $132 million over the FY05 level. However, because NSF received a 3.1 percent ($180 million) cut in FY05, the overall request level for FY06 is approximately one percent below the FY04 level. Also, the budget requests overstates the increase in NSF's actual buying power because it includes $48 million for NSF to begin paying for Coast Guard activities in Antarctica that had previously been paid for by the Coast Guard.

For the second year in a row, the largest percentage increases in the budget proposal are for personnel, administrative initiatives, and construction of major research facilities. Specifically, the Research and Related Activities (RRA) account, which funds most NSF research programs, receives a 2.7 percent increase (including

the Coast Guard funds).[7] The Education and Human Resources (EHR) Directorate, as mentioned earlier, receives a 12 percent cut.

NSF continues to receive high marks from the Office of Management and Budget for the quality of its management and the excellence of its programs. Building on its performance in the FY05 budget, NSF was one of only seven agencies awarded three green lights on the Executive Branch Management Scorecard. In addition, eight NSF programs were examined using the Program Assessment Rating Tool (PART)[8]. All eight programs received ratings of "Effective" (the highest rating). NSF was the only agency in the Federal Government to receive the highest rating on every program that was "PART-ed."

Issues/Questions Raised by the FY05 Request for NSF

Education and Human Resource Directorate (EHR): Of the seven budget categories within the Education and Human Resources Directorate, four receive major budget cuts ranging from 12 to 43 percent (Table 2): Math and Science Partnerships (MSP), Elementary, Secondary, and Informal Education (ESIE), Undergraduate Education (DUE), and Research, Evaluation, and Communication (REC). Most programs within these accounts are planning reductions in the number of new awards in 2006, and two—MSP and REC—will not make any new awards.

The Department of Education also runs an MSP program. (Both were created by Congress as part of the No Child Left Behind initiative). The Education Department program receives a proposed FY06 increase of $91 million to $269 million, but it is significantly different from its NSF counterpart. The Department of Education's program awards funds to states on a formula basis and focuses primarily on high-level mathematics while NSF's program provides competitive, merit-reviewed grants to universities and school districts to improve math and science proficiency for students of all grades.

Investments in graduate education and in human resource development, or activities to broaden participation in STEM fields, fare better. In graduate education, the request of $155 million will enable NSF to maintain its current stipend of $30,000 for top graduate students and further broaden participation in these programs. In human resource development, the funding request of $118.4 million will provide ongoing support for programs and activities that expand opportunities for traditionally under-served populations.

Major Research Equipment and Facilities Construction (MREFC): The FY06 budget request proposes $250 million for this account, $76 million (44 percent) above the FY05 level for this account, which funds large user facilities. (NSF provides funding to private entities, usually university consortia, to run the facilities.) The FY06 budget provides money for no new starts despite a backlog of projects. Five major facilities have been completed in the past two years. Each completed facility, such as the new research station at the South Pole, requires support for research as well as operations and maintenance funding once it comes on line. Those funds come out of NSF's research budget. Consequently, as MREFC projects begin operations, increasing budget pressure is placed on core research activities. NSF faces a difficult and growing challenge in balancing these two needs.

Grant Proposal Success Rate: Even as the total funding for NSF has increased significantly over the past six years (up 40 percent), the percentage of funded proposals has declined from 33 percent in FY00 to an estimated 20 percent in FY05. For FY06, NSF has set a goal of halting the decline in the success rate while maintaining grant size and duration. Given this constraint, and the relatively flat budget requested, NSF will try to reduce the number of proposals it receives, in part by reducing the number of solicitations the agency issues.

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[7] The transfer was proposed in an attempt to address ongoing disagreements between NSF and the Coast Guard regarding the proper cost to the Coast Guard of conducting ice-breaking activities. NSF faces both short- and long-term questions regarding ice-breaking operations. In the short-term, it remains unclear whether $48 million is a sufficient amount to pay for the activities. In the long-term, Congress and the Administration must consider how best to replace the current ice-breaking ships, which are aging rapidly.

[8] PART is described by the budget as a tool "developed to assess and improve program performance so that the Federal Government can achieve better results. A PART review helps identify a program's strengths and weaknesses to inform funding and management decisions aimed at making the program more effective."

Table 2.

National Science Foundation
FY 2005 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY04 Actual	FY05 Current Plan	FY06 Request	Change FY05 to FY06	
				Amount	Percent
RRA	4293	4221	4333	113	2.7%
BIO	587	577	582	5	0.9%
CISE	605	614	621	7	1.1%
ENG	566	561	581	19	3.5%
GEO	713	694	709	15	2.2%
MPS	1092	1070	1086	16	1.5%
SBE	184	197	199	2	1.0%
OISE	41	34	35	1	2.3%
OPP	342	344	387	43	12.4%[9]
IA	164	130	135	5	3.8%
EHR	944	841	737	-104	-12.4%
MREFC	184	174	250	76	44.0%
S&E	219	223	269	46	20.5%
OIG	9	10	12	1	14.7%
NSB	2	4	4	0	0.8%
Total	**5652**	**5473**	**5605**	**132**	**2.4%**

Acronyms:
RRA = Research and Related Activities
EHR = Education and Human Resources
MREFC = Major Research Equipment and Facilities Construction
S&E = Salaries & Expenses
OIG = Office of Inspector General
NSB = National Science Board
BIO = Biological Sciences
CISE = Computer & Information Science & Engineering
ENG = Engineering
GEO = Geosciences
MPS = Mathematical and Physical Sciences
SBE = Social, Behavioral, and Economic Sciences
OISE = Office of International Science and Engineering
OPP = Office of Polar Programs
IA = Integrative Activities

[9] Includes $48 million transfer from the Coast Guard for ice-breaking activities.

Table 3.

NSF Education and Human Resources Directorate
FY 2006 Budget Request (dollars in millions)
(Source: Agency budget justification)

Account	FY04 Actual	FY05 Current Plan	FY06 Request	Change FY05-06 $	Change FY05-06 %
EISE	206	182	141	-41.2	-23 %
IMD	29	29	19	-9.6	-33 %
TPC	62	60	33	-27.2	-45 %
CLT	27	26	22	-4.5	-17 %
MSP	139	79	60	-19.4	-24 %
Undergrad	163	154	135	-18.7	-12 %
SfS	16	14	10	-4.1	-29 %
CCLI	40	46	31	-9.6	-23 %
Graduate	155	155	155	0.3	0.2 %
HRD	120	119	119	-0.1	-0.1 %
CREST	14.9	15.9	18.5	2.6	16 %
MIE	2.5	2.5	0	-2.5	-100%
EPSCOR	94.2	94	94	0.3	0.3 %
REC	66.4	59	33.8	-25.7	-43 %
TOTAL	**944**	**841**	**737**	**-104**	**-12 %**

*Not a complete list of education programs.

Acronyms:
EISE – Elementary, Secondary and Informal Education
IMD – Instructional Materials Development
TPC – Teacher Professional Continuum
CLT – Centers for Learning and Teaching
SfS – Scholarship for Service
CCLI – Course, Curriculum and Laboratory Improvement
MSP – Math and Science Partnership Program
HRD – Human Resource Development
CREST – Centers for Research Excellence in Science and Technology
MIE – Model Institutions for Excellence
EPSCoR – Experimental Program to Stimulate Competitive Research
REC – Research, Evaluation and Communication

Homeland Security R&D

Homeland Security R&D at the Department of Homeland Security (DHS)

The vast majority of R&D at DHS is funded by the Science and Technology (S&T) directorate. Proposed funding for S&T is $1.37 billion, an increase of $253 million (23 percent) above the FY05 enacted level. Approximately half of this increase is not for new research, but reflects the proposed transfer into the S&T directorate of existing science programs that are now run by other parts of DHS, particularly by the Transportation Security Administration. The Science Committee has encouraged this consolidation. Even after this transfer is taken into account, the funding for DHS S&T still increases by $126 million (11 percent).

One major new initiative within DHS S&T is the formation of a Domestic Nuclear Detection Office (DNDO) ($227 million, of which $124 million is new funding). The DNDO will be located at DHS, but will include representatives from other agencies, such as DOE and DOD. The Office will be responsible for R&D related to detection of nuclear and radiological materials, but will also coordinate the acquisition and deployment of a national domestic nuclear detection system and the establishment of protocols and training for users of detection equipment. Other new initiatives in DHS S&T include a new program on detection of certain chemical agents and initial work on a national bio- and agro-defense facility.

S&T Directorate funding is split among various technical portfolio areas, such as biological countermeasures, standards, critical infrastructure protection, and sup-

port of conventional DHS missions (such as the Secret Service); a complete list of portfolios and their funding is provided in Table 3. Most of the portfolio areas, other than those directly involved in the initiatives described above, remain flat or decrease slightly.

Homeland Security R&D at Other Agencies

Approximately $2.8 billion is proposed for homeland security R&D programs in departments and agencies outside of DHS (Table 10). The bulk of this funding, $1.8 billion (up 3.2 percent from FY05), is for bio-defense programs at NIH, such as basic research on infectious microbial agents, applied research on diagnostics, vaccines, and therapies, and construction of bio-safety facilities. The remaining funds (approximately $1.1 billion) go to a number of other agencies, such as: EPA, for research on detection of chemical and biological agents in the water supply; NSF, for research related to critical infrastructure protection and microbial genomics; the U.S. Department of Agriculture (USDA), for research on animal disease diagnostics and vaccines; DOD for detection systems, protective gear, and vaccines for biological and chemical agents; and DOE's National Nuclear Security Administration for research on detection and attribution of radiological and nuclear materials.

In addition to individual agency programs, a number of cooperative efforts between DHS and other agencies exist: NSF and DHS jointly fund a cyber security testbed; DHS provides funding to NIST for standards work in a number of areas, such as standards for radiation detectors; and EPA and DHS co-fund a university center on microbial risk assessment.

Issues/Questions Raised by the FY06 Request for DHS

Balance of DHS S&T Programs: Most of the work of the Directorate is heavily weighted toward development. Relatively little goes to fund longer-term, more basic research. As a result, relatively little of the funding is available to universities, although DHS S&T does fund several university centers. Whether this shorter-range focus is optimal for U.S. long-term security has been a matter of debate.

Table 4.

Department of Homeland Security
Science and Technology Directorate
FY 2005 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY04 Actual	FY05 Enacted	FY06 Request	Amount Change	Percent Change
Biological Countermeasures (including NBACC & PIADC)	459	398	362	-35	-8.9%
Nuclear & Radiological Countermeasures	106	123	19	-104	-84.4%
Domestic Nuclear Detection Office			227	227	NA
Chemical Countermeasures	23	53	102	49	92.5%
High Explosives Countermeasures	7	20	15	-5	-25.4%
Threat and Vulnerability, Testing and Assessment	59	66	47	-19	-28.6%
Counter-ManPADS	17	61	110	49	80.3%
Support of DHS Conventional Missions	21	55	94	39	71.4%
Rapid Prototyping Program	68	76	21	-55	-72.5%
Standards/State and Local Programs	32	40	36	-4	-10.6%
Emerging Threats	11	11	11	0	-2.3%
University Centers & Fellowship Programs	22	70	64	-6	-9.1%
Cybersecurity	10	18	17	-1	-7.2%
Critical Infrastructure Protection	12	27	21	-6	-23.0%
Interoperability & Communications	0	21	21	-1	-2.4%
SAFETY Act Implementation	0	10	6	-4	-44.0%
Transferred RDT&E Programs*	0	0	117	117	NA
Unobligated Balance	22	0	0	0	NA
Administration/Salaries	44	69	81	13	18.7%
Total	**913**	**1115**	**1368**	**253**	**22.7%**

*The RDT&E programs transferred into DHS S&T from elsewhere in DHS are mostly from the Transportation Security Administration, with some funds also from the U.S. Coast Guard, Customs & Borders Protection, and The Infrastructure Protection unit.

Acronyms:
NBACC = National Biodefense Analysis and Countermeasures Center
PIADC = Plum Island Animal Disease Center
ManPADS = Man Portable Air Defense Systems
RDT&E = Research, Development, Test, and Evaluation
NA = Not Applicable

Note: The request for DHS S&T presents proposed and past funding levels by technical topic, not by organizational unit or research performer. To supplement the "portfolio area" information in the budget request, DHS has provided approximate estimates for how funds will be distributed among research performers in FY05: funding for the private sector will be about $650 million (with roughly $290 million distributed via HSARPA), funding for the national laboratories will be about $250M, funding for university centers of excellence and individual student fellowships will be $72 million, and funding provided to other government agencies will be about $80 million.

National Institute of Standards and Technology (NIST)

NIST's Laboratory Programs

The FY06 budget requests $426 million for a wide range of research conducted at NIST laboratories in Gaithersburg, Maryland, and Boulder, Colorado. The request is $47 million (12 percent) above the FY05 enacted level of $378 million, and is slightly above the FY05 request. NIST's budget was severely cut in FY04, leading to early retirements and disruption of NIST's program activities. The FY05 appropriation restored enough funding to maintain current programs and personnel.

The Administration's request for FY06 includes $40 million for initiatives in three broad thematic areas: Advances in Manufacturing ($20 million), Measurements and Standards for Homeland Security ($3 million), and New Measurement Horizons for the U.S. Economy and Science ($17 million).

The Advances in Manufacturing initiative is intended to strengthen U.S. efforts to commercialize nanotechnology, to improve software to better coordinate the activities of all the suppliers involved in manufacturing a particular product, and to improve U.S. competitiveness by making sure that technical standards abroad do not disadvantage U.S. products. Measurements and Standards for Homeland Secu-

rity will fund a permanent research program at NIST in biometrics (the use of equipment to identify people by such biological means as fingerprints, iris patterns, etc.), and the development of better standards for equipment for firefighters and other first responders. New Measurement Horizons for the U.S. Economy and Science will increase NIST research in such areas as biotechnology and quantum computing—fields in which the U.S. needs to establish and sustain a leadership role if it is to be competitive.

Issues/Questions Raised by the FY06 Request for NIST

National Nanomanufacturing and Nanometrology Facility (N3F): To open its new manufacturing laboratory to nanotechnology users outside the government, NIST needs specialized equipment, and a dedicated budget to maintain the facilities. Although the FY06 budget requests the maintenance funding, the request for equipment is much less than the $25 million requested (but not appropriated) for FY05. As a result, the N3F may not be sufficiently equipped to support the goals of the National Nanotechnology Initiative.

Impact of Proposed Elimination of the Advanced Technology Program (ATP): The FY06 budget request proposes to eliminate ATP, but provides no funds for the orderly shut down of the program, including the costs to reassign or eliminate 228 positions. These costs could be as high as $20 million. Moreover, ATP is expected to fund an estimated $13 million worth of R&D conducted at the NIST laboratories in FY05. Therefore, the proposal to end ATP could result in one-time costs to NIST of up to $33 million, eating up much of the proposed increase for the NIST laboratories.

Impact of Scaling Back the Manufacturing Extension Partnership (MEP) Program: The FY06 request for MEP is $46.8 million, which represents about a 60 percent cut from the FY05 enacted level of $109 million. At this level, it is unclear how the MEP program would function as a national network.

Table 5.

National Institute of Standards and Technology
FY 2006 Budget Request (budget in millions)
(Source: Agency Budget Justification)

Account	FY 2004 Enacted	FY 2005 Enacted	FY 2006 Request	Amount Change	Percent Change
EEE	44.1	48.9	50.8	1.9	3.9%
ME	21.5	23.4	28.0	4.5	19.4%
CST	43.5	43.3	52.4	9.0	20.9%
Phys	38.5	41.2	46.7	5.4	13.3%
MSE[1]	54.5	60.0	33.5	-26.5	-44.2%
BFR	19.5	21.4	24.3	2.8	13.2%
CSAM	50.8	62.9	68.4	5.4	8.7%
STS	15.4	15.3	20.1	4.7	30.9%
RS[2]	45.1	56.4	48.3	-8.1	-14.4%
BQP	5.4	5.3	5.6	0.2	4.9%
Facilities					
CNR	0	0	29.5	29.5	--
N3F	0	0	16.0	16.0	--
Construction	64.2	72.5	58.8	-13.6	-18.8%
ITS					
ATP	177.3	140.3	0	-140.3	-100.0%
MEP	39.1	107.5	46.8	-60.7	-56.5%
TOTAL	619.4	699.2	529.6	-169.5	-24.3%

[1]The $26.5 million decrease in the Materials Science and Engineering account is due to moving the Center for Neutron Research (CNR) into a new, separate account.

[2]The $8.1 million decrease in Research Support account and the $13.6 million reduction in the Construction account is due to the removal of FY05 congressional earmarks from the FY 2006 President's request.

Acronyms:

EEE = Electronics and Electrical Engineering
ME = Manufacturing Engineering
CST = Chemical Science and Technology
Phys = Physics
MSE = Materials Science and Engineering
BFR = Building and Fire Research
CSAM = Computer Science and Applied Mathematics
STS = Standards and Technology Services
BQP = Baldrige Quality Program
RS = Research Support
CNR = Center for Neutron Research
N3F = National Nanotechnology and Nanometrology Facility
ITS = Industrial Technology Services
ATP = Advanced Technology Program
MEP = Manufacturing Extension Partnership

National Oceanic and Atmospheric Administration (NOAA)

The FY06 budget requests $3.6 billion for NOAA, a decrease of $300 million (eight percent) compared to the FY05 enacted level of $3.9 billion. However, NOAA's FY05 budget includes approximately $430 million worth of Congressionally mandated projects. If these earmarks are removed from the FY05 baseline, then the President's budget could be construed as proposing an additional $200 million (six percent increase) for NOAA in FY06.

National Weather Service

The FY06 budget requests $839 million for the National Weather Service (NWS), an increase of $56 million (seven percent). The request includes $8.7 million to expand and modernize technology capabilities at the NWS, including upgrades to the

NOAA Weather Radio All-Hazards warning network, a new drought forecasting initiative, and upgrades to the supercomputers used in weather forecasting.

Tsunami Warning and Detection System

The FY06 budget request includes $9.5 million for NOAA to expand the U.S. Tsunami Warning Network, an issue considered by the Committee during a hearing on January 26, 2005. This request, combined with $14.5 million in supplemental funds in FY05, will allow NOAA to procure and deploy tsunami detection buoys in a system designed to provide continuous tsunami warning capability for both the Pacific and Atlantic coasts of the United States and in the Caribbean.

Satellite Acquisition

The FY06 budget requests $964 million for satellite programs at NOAA. This request is a $57 million (six percent) increase over the FY05 enacted level of $907 million. The increase is for procurement, acquisition, and construction of the next generation of weather satellites, and is in line with the long-term budget plans for these satellite systems. NOAA's polar-weather satellites are vital for three to seven day weather forecasts, tracking of severe weather such as hurricanes, and for climate observations. The next-generation of polar satellites is currently under development, with the first launch planned for 2010.

Issues/Questions Raised by the FY06 Request for NOAA

Weather Satellite Cost Increases: In September 2004, the Government Accountability Office (GAO) completed a report for the Committee on the costs and risks associated with NOAA's next-generation polar satellite program. The current projection for the cost of the next generation polar satellite system has risen from $6.5 billion to $8.1 billion and GAO estimates it is likely to rise by another $500 million before the system is complete. The Committee recently learned that availability one of the key sensors on the new polar satellite will be delayed by 16 months due to technical difficulties in developing the sensor. Cost overruns in satellite programs could force NOAA to take resources away from other important core missions at the agency.

Tsunami Warning Network: While the FY06 budget (along with the FY05 supplemental appropriations request) funds the purchase of new tsunami detection buoys, funding in the out-years for the operation and maintenance of the proposed tsunami warning system is uncertain. Each buoy costs approximately $500,000 to purchase and deploy and has a design life of less than two years, so NOAA's estimated $350,000 for annual operation and maintenance seems inadequate. Also, funding is uncertain for tsunami education and outreach programs, which witnesses told the Committee are as important as tsunami detection in preventing deaths.

Table 6.

National Oceanic & Atmospheric Administration
FY 2006 Budget Request (dollars in millions)
(Source: Agency budget justification)

Account	FY04 Actual	FY05 Enacted	FY06 Request	Percent Change
NOS	606	669	415	-38.0%
ORF[1]	505	541	394	-27.2%
PAC[2]	100	127	15	-88.2%
Other	1	1	6	500.0%
OAR	414	414	372	-10.1%
ORF	393	404	362	-10.4%
PAC	21	10	10	0.0%
Other	0	0	0	0.0%
NWS	825	783	839	7.2%
ORF	722	704	745	5.8%
PAC	103	79	94	19.0%
Other	0	0	0	0.0%
NESDIS	827	907	964	6.3%
ORF	152	176	154	-12.5%
PAC	675	731	810	10.8%
Other	0	0	0	0.0%
Program Support[1]	363	449	398	-11.4%
ORF	305	368	344	-6.5%
PAC	40	64	36	-43.8%
Other	18	18	18	0.0%
NMFS	760	824	728	-11.7%
Transfers	($106)	($128)	($130)	----
Total	**3690**	**3918**	**$3,586**	**-8.5%**

ORF = Operations, Research and Facilities
PAC = procurement, Acquisition and Construction
[1] Includes Fleet and Aircraft Maintenance and NOAA HQ Accounts

[2] National Marine Fisheries Service is budgeted under NOAA, but is under jurisdiction of the Resources Committee

7. Witnesses Questions

Witnesses have been asked to:

1. Review the R&D budget request in the context of the Administration's overall priorities in science and technology.
2. Describe the mechanisms that the Administration uses to determine priorities across scientific disciplines.
3. Describe the mechanisms the Administration uses to coordinate its scientific research and technical development activities with other federal agencies.

APPENDIX I: Budget Tables for Selected Interagency Programs.

Table 7. National Nanotechnology Initiative

(Dollars in Millions)

	FY04 Actual	FY05 Estim.	**FY06 Proposed**	Change FY05-06	
				Amount	Percent
NSF	256	338	**344**	6	1.8%
Defense	291	257	**230**	-27	-10.5%
Energy	202	210	**207**	-3	-1.4%
NIST	77	75	**75**	0	0.0%
NASA	47	45	**35**	-10	-22.2%
NIH/NIOSH	108	145	**147**	2	1.4%
EPA	5	5	**5**	0	0.0%
DHS	1	1	**1**	0	0.0%
USDA	2	3	**8**	5	166.7%
Justice	2	2	**2**	0	0.0%
Total	991	1081	**1054**	-27	-2.5%

(Source: Federal budget analytical perspectives, page 69)

Acronyms
NIH = National Institutes of Health
NIOSH = National Institute for Occupational Safety and Health
USDA = U.S. Department of Agriculture

Table 8. Networking and Information Technology R&D

(dollars in millions)

	FY04 Actual	FY05 Estim.	**FY06 Proposed**	Change FY05-06	
				Amount	Percent
Defense	241	278	**299**	21	7.6%
NSF	773	795	**803**	8	1.0%
HHS	542	589	**569**	-20	-3.4%
Energy	343	370	**341**	-29	-7.8%
Commerce	47	58	**62**	4	6.9%
NASA	258	163	**74**	-89	-54.6%
EPA	2	4	**6**	2	50.0%
Total	2206	2256	**2155**	-101	-4.5%

Totals may not add, due to rounding.
(Source: Supplement to the Budget: Guide to the NITRD Program FY05-FY06)

Acronyms
HHS = Department of Health and Human Services

APPENDIX I: Budget Tables for Selected Interagency Programs. (Continued)

Table 9. Climate Change Science Program

(dollars in millions)

	FY04 Actual	FY05 Estimate	**FY06 Request**	Change FY05-06	
				Amount	Percent
NSF	215	198	**197**	-1	-1%
Energy	133	129	**132**	3	2%
Commerce	116	124	**181**	57	46%
USDA	70	73	**88**	15	21%
Interior	28	24	**24**	0	0%
EPA	22	20	**21**	1	5%
NIH	61	65	**65**	0	0%
NASA	1321	1264	**1162**	-102	-8%
All Other	14	16	**16**	0	0%
Total	1980	1913	**1886**	-27	-1%

(Source: Federal budget analytical perspectives, page 69)

Table 10. Homeland Security R&D

(dollars in millions)

	FY04 Estimate	FY05 Estimate	**FY06 Request**	Change FY05-06	
				Amount	Percent
HHS	1,643	1,608	**1,766**	158	9.8%
DHS	816	1,017	**1,227**	210	20.6%
Defense	267	362	**394**	32	8.8%
NSF	318	324	**328**	4	1.2%
Justice	49	61	**109**	48	78.7%
USDA	22	31	**67**	36	116.1%
Commerce	17	59	**62**	3	5.1%
Energy	19	32	**52**	20	62.5%
EPA	30	25	**40**	15	60.0%
Treasury	3	3	**3**	0	0.0%
Transportation	0	0	**1**	1	N/A
Total	3,185	3,522	**4,048**	526	14.9%

Totals may not add, due to rounding.

(Source: Office of Management and Budget)

APPENDIX II:

Federal R&D Spending (adapted from FY06 Budget Request)*

By Agency	2004 Actual	2005 Estimate	2006 Proposed	$ Change 05-06	% Change 05-06
Defense	65,462	70,422	70,839	417	1%
Health and Human Services	28,047	28,752	28,807	55	0%
NASA	10,574	10,990	11,527	537	5%
Energy	8,779	8,629	8,528	-101	-1%
National Science Foundation	4,160	4,082	4,194	112	3%
Agriculture	2,222	2,415	2,039	-376	-16%
Homeland Security	1,053	1,185	1,467	282	24%
Commerce	1,137	1,134	1,013	-121	-11%
Transportation	661	748	808	60	8%
Veterans Affairs	866	784	786	2	0%
Interior	627	615	582	-33	-5%
Environmental Protection Agency	661	572	569	-3	-1%
Other	1,089	1,243	1,145	-98	-8%
Total	**125,338**	**131,571**	**132,304**	**733**	**1%**
Basic Research					
Defense	1,358	1,513	1,319	-194	-13%
Health and Human Services	14,780	15,124	15,246	122	1%
NASA	2,473	2,368	2,199	-169	-7%
Energy	2,847	2,887	2,762	-125	-4%
National Science Foundation	3,524	3,432	3,480	48	1%
Agriculture	829	851	788	-63	-7%
Homeland Security	68	85	112	27	32%
Commerce	43	58	71	13	22%
Transportation	20	38	41	3	8%
Veterans Affairs	347	315	315	0	0%
Interior	37	36	30	-6	-17%
Environmental Protection Agency	113	66	70	4	6%
Other	149	155	175	20	13%
Subtotal	**26,588**	**26,928**	**26,608**	**-320**	**-1%**
Applied Research					
Defense	4,351	4,851	4,139	-712	-15%
Health and Human Services	13,007	13,274	13,410	136	1%
NASA	3,006	2,497	3,233	736	29%
Energy	2,893	2,760	2,709	-51	-2%
National Science Foundation	266	279	276	-3	-1%
Agriculture	1,055	1,093	942	-151	-14%
Homeland Security	247	346	399	53	15%
Commerce	828	825	763	-62	-8%
Transportation	349	423	494	71	17%
Veterans Affairs	476	430	433	3	1%
Interior	538	530	495	-35	-7%
Environmental Protection Agency	423	365	386	21	6%
Other	599	562	553	-9	-2%
Subtotal	**27,838**	**28,235**	**28,232**	**-3**	**0%**
Development					
Defense	59,701	63,903	65,331	1,428	2%
Health and Human Services	41	54	28	-26	-48%
NASA	3,189	3,727	3,511	-216	-6%
Energy	1,992	1,846	1,959	113	6%
National Science Foundation	N/A	N/A	N/A	N/A	N/A
Agriculture	159	157	146	-11	-7%
Homeland Security	481	599	746	147	25%
Commerce	152	149	90	-59	-40%
Transportation	279	269	254	-15	-6%
Veterans Affairs	43	39	38	-1	-3%
Interior	49	46	54	8	17%
Environmental Protection Agency	125	141	113	-28	-20%
Other	324	495	396	-99	-20%
Subtotal	**66,535**	**71,425**	**72,666**	**1,241**	**2%**

*Columns are incomplete due to omission of additional R&D activities of certain agencies

Chairman BOEHLERT. Okay. The hearing will come to order.

I want to welcome everyone here to what might be seen as the official opening of budget season for the House Science Committee. I am pleased to say that we will be hearing this morning from most of the top science officials in the Federal Government.

I am especially gratified to welcome Secretary Bodman here this morning. His presence here signals the new cooperative science-oriented leadership he will be bringing to the Department of Energy. I know that we will have the same productive relationship with Sam Bodman at DOE that we did when he was Deputy Secretary of Commerce, and I am pleased to have him back in this committee's orbit. Mr. Secretary, welcome back.

But while I am delighted to have so much talent arrayed before us this morning, one would hardly describe the tone of this morning's hearing as festive. The budget proposal before us raises serious questions about our nation's direction in the coming years.

While the President's budget proposal for research and development can legitimately be seen as a glass half full or a glass half empty, no one could describe it as a glass that is filled enough to satisfy the Nation's thirst for scientific advancement.

Let me elaborate.

The budget is a glass half full in that R&D, as a whole, has fared better, and basic research has fared no worse than non-defense domestic discretionary spending as a whole. In other words, it would be unfair to describe the attitude behind this budget as in any way "anti-science." We are living through a period of stringent austerity, and the science budget reflects that rather than any hostility toward science.

There are also some grace notes in the otherwise dirge-like tone of the budget. The National Science Foundation gets one of the largest increases in the budget, although not enough to keep pace with inflation, especially after the Coast Guard transfer is subtracted. And the internal laboratories of the National Institute of Standards and Technology, a top priority of this committee, would receive a 12 percent increase.

But this budget is also a glass half empty. Key science agencies, most notably, perhaps, DOE's Office of Science, would see their budgets cut. NSF education programs would be cut by 12 percent, about as misguided a policy as one could imagine. I should say Congress tried going down this foolhardy path with regard to NSF in the early 1980s and quickly and wisely reversed course.

And perhaps most disturbingly of all, the outlook for the outyears seems to be more of the same.

Now, I don't doubt that science growth will have to be restrained in this budget environment. We might have to eliminate some programs, such as the oil and gas research programs the Administration has targeted.

But I think we have to think long and hard about whether it is in the long-term interest of the United States to have a multi-year period of real dollar cuts in spending on research and development. And we have to think more clearly about what our priorities are in a period of restrained growth, a topic I will be returning to at tomorrow's hearing on NASA's budget.

With so much at stake, I am eager to turn to our witnesses, although they may no longer feel so eager themselves. I understand that each of them has devoted large portions of their careers, very distinguished careers, I might add, to creating a healthy, effective, federal science establishment. It is our job to help them get more "wallet" to go with their "will," to hearken back to a phrase from President Bush.

Let me end on a more positive note. For us to review the budget effectively, we need the maximum amount of information from the Administration. In the past, one of our frustrations has been getting accurate numbers for what was being spent on the interagency high performance computing program, another of this committee's priorities. Dr. Marburger and Josh Bolten and I had a flurry of correspondence on this last year.

I am pleased to say that this year those numbers arrived here on time, as required by law. And I want to thank Dr. Marburger and his staff and the staff at OMB and the relevant agencies for working cooperatively with us on this. It will make all our jobs easier, and it reflects the great working relationship we have, even as we may disagree on some budget decisions. So, please communicate my thanks to all involved on this.

Mr. Gordon.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD L. BOEHLERT

I want to welcome everyone here to what might be seen as the official opening of budget season for the House Science Committee. I am pleased to say that we will be hearing this morning from most of the top science officials in the Federal Government.

I am especially gratified to welcome Secretary Bodman here this morning. His presence here signals the new cooperative, science-oriented leadership he will be bringing to the Department of Energy (DOE). I know that we will have the same productive relationship with Sam Bodman at DOE that we did when he was Deputy Secretary of Commerce, and I'm pleased to have him back in this committee's orbit.

But while I am delighted to have so much talent arrayed before us this morning, one would hardly describe the tone of this morning's hearing as "festive." The budget proposal before us raises serious questions about our nation's direction in the coming years.

While the President's budget proposal for R&D (research and development) can legitimately be seen either as a glass half full or a glass half empty, no one could describe it as a glass that is filled enough to satisfy the Nation's thirst for scientific advancement.

Let me elaborate.

The budget is a glass half full in that R&D as a whole has fared better, and basic research has fared no worse, than non-defense domestic discretionary spending as a whole. In other words, it would be unfair to describe the attitude behind this budget as in any way "anti-science." We are living through a period of stringent austerity, and the science budget reflects that rather than any hostility toward science.

There are also some grace notes in the otherwise dirge-like tone of the budget. The National Science Foundation (NSF) gets one of the largest increases in the budget, although not enough to keep pace with inflation, especially after the Coast Guard transfer is subtracted. And the internal laboratories of the National Institute of Standards and Technology (NIST), a top priority for this committee, would receive a 12 percent increase.

But this budget is also a glass half empty. Key science agencies, most notably perhaps DOE's Office of Science, would see their budgets cut. NSF education programs would be cut by 12 percent—about as misguided a policy as one could imagine. I should say Congress tried going down this foolhardy path with regard to NSF in the early 1980s and quickly reversed course.

And perhaps most disturbingly of all, the outlook for the out-years seems to be more of the same.

Now, I don't doubt that science growth will have to be restrained in this budget environment. We might have to eliminate some programs, such as the oil and gas research programs the Administration has targeted.

But I think we have to think long and hard about whether it is in the long-term interest of the United States to have a multi-year period of real dollar cuts in spending on R&D. And we also have to think more clearly about what our priorities are in a period of restrained growth—a topic I'll be returning to at tomorrow's hearing on NASA's budget.

With so much at stake, I'm eager to turn to our witnesses—although they may no longer feel so eager themselves. I understand that each of them has devoted large portions of their careers to creating a healthy, effective federal science establishment. It's our job to help them get more "wallet" to go with their "will"—to hearken back to a phrase from the first President Bush.

Let me just end on a more positive note. For us to review the budget effectively, we need the maximum amount of information from the Administration. In the past, one of our frustrations has been getting accurate numbers for what was being spent on the interagency high performance computing program, another of this committee's priorities. Dr. Marburger and Josh Bolten and I had a flurry of correspondence on this last year.

I'm pleased to say that this year those numbers arrived here on time, as required by law. So I want to thank Dr. Marburger and his staff and the staff at OMB and the relevant agencies for working cooperatively with us on this. It will make all our jobs easier, and it reflects the great working relationship we have, even as we may disagree on some budget decisions. So, please communicate my thanks to all involved with that.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman. I want to join you in welcoming this very distinguished panel. And also, as usual, I could just say amen to my Chairman's opening statements on most occasions. And I want to say amen again. This is a very distinguished panel, and I know all of you have spent a career and a lifetime trying to make our country more advanced in the sciences, and we thank you for that.

And Mr. Chairman, I agree with you as to your analysis of the budget. And I also agree that the science budget today could have been worse. But that doesn't mean that we just take what we get and passively make lemonade out of lemons. We can not ignore the cumulative damage this is going to do to our nation's future.

This is my second year as Ranking Member, and I come to you today even more distressed about the lack of foresight shown in putting together this R&D budget than I was last year.

I am particularly concerned that reports have claimed that Dr. Marburger called this a "pretty good year" for research funding. How can this be a "pretty good year" when the federal science and technology budget decreased by $877 million?

How can this Administration contend that a 12.4 percent cut to K–12 science and math education is a "pretty good year," or a six percent decrease in NASA's aeronautics, $320 million less to basic research and an 8.2 percent cut to NOAA research even after the tsunami disaster that we just witnessed? That doesn't sound to me like a "pretty good year."

I wish that was the end of the list, but it is only the beginning. NSF is over $5 billion behind the authorized level that this Administration signed into law. The Department of Energy research was slashed 4.1 percent for their Office of Science, cut three percent for high-energy physics research, and cut 8.4 percent for nuclear physics.

And I want to remind everyone that research in nuclear, high-energy, and condensed matter physics is not just some random aca-

demic exercise. Research in these areas has led to many remarkable innovations, including PET scans, MRIs, nuclear medicine, and cancer research.

The Manufacturing Extension Program, probably the most effective federal program in providing immediate help to U.S. manufacturers, is again slashed severely. The Advanced Technology Program is again eliminated, and technology transfer programs at NASA and DOE are cut. It makes no sense to cut job creation programs when U.S. manufacturing is losing tens of thousands of jobs to overseas competition.

This was not a "pretty good year," not under any circumstances.

The current approach of this Administration is shortsighted. It ignores the vital role that research performed today plays in our quality of life and our world position tomorrow. We can and we must do better to secure our nation's future prosperity. And we must redefine the discussion. We need to consider science and technology research as an investment.

I have said it before, and I will say it again today, maintaining a lead in science and technology is a flat-out race. If we stop running at the top speed we can manage, we will lose. Even in the current fiscal crisis, this budget is not the top speed we can manage for science and technology investment. Lack of investment in innovation now will come to roost later, or as my father used to say, we are eating our seed corn.

We all understand the need for reasonable cuts and budget realignments, but we must do so with an eye towards our country's future. I will work with my colleagues on both sides of the aisle to try to realign the Administration's spending priorities to better meet our science and technology needs and to guard our future fiscal prosperity.

Thank you, and I yield back. Thank you, Mr. Chairman.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

Thank you Mr. Chairman. I join you in welcoming our distinguished panel to this morning's hearing. And I agree with you, Mr. Chairman, that the science budget before us today could have been worse—but that doesn't mean we just take what we get and passively make lemonade out of lemons. We cannot ignore the cumulative damage this is doing to our future.

This is my second year as Ranking Member and I come to you today even more distressed about the lack of foresight that this Administration has shown in putting together this R&D budget than I was last year.

I'm particularly concerned that reports claim Dr. Marburger called this a "pretty good year" for research funding. How can this be called a "pretty good year" when the Federal Science and Technology budget decreased by $877 million dollars?

How can this Administration contend that a 12.4 percent cut to K–12 Science and Math Education is a "pretty good year;" a six percent decrease in NASA aeronautics; $320 million dollars less to basic research and a 8.2 percent cut to NOAA research—even after the tsunami disaster the world just witnessed? That doesn't sound like a "pretty good year" to me.

I wish that was the end of the list, but it is only the beginning. NSF is over $5 billions dollars behind the authorization level that this Administration signed into law.

Department of Energy research was slashed 4.1 percent for their Office of Science, cut three percent for high-energy physics research, and 8.4 percent cuts for nuclear physics.

I want to remind everyone that research in nuclear, high energy and condensed matter physics is not just some random academic exercise. Research in these areas

has led to many remarkable innovations including PET scans, MRIs, nuclear medicines and cancer therapies.

The Manufacturing Extension Program—probably the most effective federal program in providing immediate help to U.S. manufacturers—is—AGAIN—slashed severely. The Advanced Technology Program is—AGAIN—eliminated. It makes no sense to cut job creation programs when U.S. manufacturing is losing tens of thousands of jobs to overseas competition.

This was not a pretty good year—not under any circumstances.

The current approach of this Administration is short sighted—it ignores the vital role that research performed *today* plays in our quality of life and world position *tomorrow*. We can and we must do better to secure our nation's future prosperity. We must redefine the discussion. We need to consider science and technology research as an investment—not spending.

I've said it before and I will say it again now—Maintaining a lead in science and technology is a flat out race. If we stop running at the top speed we can manage, we will lose. Even in the current fiscal crisis, this budget is not the top speed we can manage for science and technology investment. Lack of investment in innovation and invention *now* will come home to roost *later*.

We all understand the need for reasonable cuts and budget realignments, but we must do so with an eye towards our country's future. I will work with my colleagues on both sides of the aisle to try to realign this Administration's spending priorities to better meet our science and technology needs and guard our future fiscal prosperity.

Thank you.

Chairman BOEHLERT. Thank you, Mr. Gordon, I think.

You have presented much that I find myself in agreement with, but most of the presentation was the half empty side of the glass, and I tried to concentrate on the half-full side of the glass.

The bottom line is this: whether you are a Democrat or a Republican, Chairman or a Ranking Member, we are committed to the proposition that wise investments in science pay handsome dividends for our future. And I know the panelists before us share that view. I also know the panelists before us and their departments have to go through a process. And we do not consider the science enterprise in isolation. It is in conjunction with all of the other many demands on the budget, particularly during this very difficult time.

But I think it is fair to say there is widespread agreement on this on a bipartisan basis that, if anything, we need more investment in science, not because it is under our jurisdiction, although that is important to us, not because we have an appreciation for these programs, which we do, but because we know it represents a sound investment in our nation's future, and we also know that it is a very competitive world out there, and others are racing when sometimes it appears that, in certain areas, we are strolling along. We need to engage in that race, because I want to be first. We are first now, and I want to retain that premier position.

[The prepared statement by Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

Chairman Boehlert, I am pleased that we are here today to discuss one of our most pressing of national issues, the Federal Government's investment in science and technology.

Science and technology are critical to our economic prosperity and national security. Economists have attributed much of our nation's improvement in productivity in recent years to the results of research and development. Productivity improvement and technological breakthroughs spurred the longest period of economic expansion in our nation's history, and they hold the key for stimulating our economy now as well as protecting our nation through application of such advancements.

I understand that the FY 2006 budget request represents the Administration's priorities of space exploration and national defense. I am pleased to see that the Department of Homeland Security's science and technology budget is enhanced by more than 10 percent, as well as the Administration's substantial commitment to the exploration program at NASA.

I would like to address three parts of the budget request in particular; the Department of Energy's Office of Science, the National Science Foundation, and the National Institute for Standards and Technology.

The Department of Energy's Office of Science funds 40 percent of our nation's physical science research. Research in these areas has led to many new economic and medical advancements including, among others, new energy sources, the Internet, cell phones and laser surgery. To maintain our economic, technical, and military preeminence, the Federal Government must continue to support research in these areas. The FY 2006 budget request for the Office of Science is $3.46 billion—a decrease of almost four percent from the FY 2005 enacted level. I was disappointed to learn that the plans for the new Rare Isotope Accelerator (RIA) as well as the BTev physics facility at the Fermi National Laboratory have been postponed indefinitely, in light of the lack of funding for these projects. RIA is tied for number three priority for large facilities ranked by the Department, and is essential for our country to maintain leadership in nuclear science research.

I'd also like to specifically address the FY 2006 budget request for the National Science Foundation, which is tasked with promoting the progress of science; advancing the national health, prosperity, and welfare; and securing the national defense. The NSF FY 2006 budget request of $5.6 billion is a 2.4 percent increase over FY 2005 appropriations; however, it is $2.9 billion below the authorized funding level necessary to complete the commitment Congress made to double NSF funding in 2002. I continue to support this doubling commitment, and I regret that in this austere budget environment it may not be immediately possible to fulfill this obligation.

NSF is the only federal agency dedicated solely to supporting basic scientific research. NSF funding accounts for one-fifth of all federal support for basic research and 40 percent of physical science research at academic institutions. Nearly 90 percent of these awards are made through a competitive, merit-review process that ensures that excellent and innovative research is being supported. Furthermore, NSF consistently receives the highest rating from OMB for the efficiency and excellence of its programs.

NSF is also the primary federal supporter of science and math education; it underwrites the development of the next generation of scientists and engineers. I am particularly concerned about the trend of the current budget request that reduces the Education and Human Resources budget at the Foundation by more than $104 million, or 12 percent. This dramatic decrease is unparalleled in other parts of the federal science and technology portfolio. Decreasing awards in education, or eliminating any new awards entirely, seems very shortsighted when we are currently facing the challenge of adequately preparing our students to enter science and technology fields. I have worked very hard to maintain the Math and Science Partnership program at NSF, where grants are awarded on a peer-reviewed basis that complements the strengths of a research-based organization. The FY 2006 request for the Math and Science Partnerships of $60 million will only allow continued funding for the programs that were started in previous years, eliminating the future of an incredibly important program to determine how our students learn the subjects of math and science.

Though research grant funding is relatively stable in the FY 2006 budget request, the grant proposal success rate at NSF continues to decline as the number of applications rises. The decrease from 33 percent of funded proposals in FY 2000 to an estimated 20 percent in FY 2005 contributes to my concern about what type of effect this may have on innovative, young researchers struggling to maintain their careers in such a competitive environment. As a larger percentage of worthy work is not funded, I believe that such an environment will adversely affect those considering entering science and technology fields. Maintaining a higher success rate through reducing the number of solicitations or other similar means is a disservice to our national needs and sends the wrong message to those exploring the edge of science and technology innovation.

On a more positive note, I am pleased that the President is requesting $426 million, or a 12 percent increase, for the National Institute of Standards and Technology (NIST) laboratories. NIST has a proven track record in research and development on standards and measurement techniques that help U.S. industries become more globally competitive and retain leadership in cutting-edge technologies. I am particularly pleased that the request includes $19 million in funding for an Advanced Manufacturing research initiative. This initiative is aimed at speeding the

development of industrial applications of nanotechnology and streamlining manufacturing standards. It will help small and medium-sized manufacturers and has goals very similar to the Manufacturing Technology Competitiveness Act which I passed through the House last Congress.

However, I am very concerned about a different manufacturing program at NIST. The President's FY 2006 budget request cuts the Manufacturing Extension Partnership (MEP) program by over 50 percent to $46.8 million. I have worked very hard over the years to help my colleagues in Congress understand that MEP is vital to retaining American competitiveness and American jobs, and I believe they appreciate the value of this program. Yet each budget cycle the Administration proposes to significantly cut this program, which the Department of Commerce itself recognized as a valuable program in a 2004 report on manufacturing. Diminishing funding for MEP will devastate small and medium-sized manufacturers and in the long run severely hurt our competitive edge in the manufacturing sector.

I am supportive of the President's FY 2006 budget request of $3.5 billion for the National Oceanic and Atmospheric Administration (NOAA). While this represents a nearly $300 million (or eight percent) decrease from the FY 2005 enacted level, the reduction is from the elimination of congressionally directed projects.

In summary, I cannot emphasize enough that I believe funding for science and technology must be a priority in the FY 2006 budget. While the overall request for NSF is in the right direction, I am very concerned about the cuts to the education programs and I will continue to work to highlight the importance of critical programs like the Math and Science Partnerships. I am pleased with the Administration's request of $426 million for the NIST labs and pledge to work with my colleagues to see that request fully funded.

[The prepared statement by Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. I want to thank the witnesses for appearing before our committee to discuss the President's FY06 Budget for Research and Development. Today's hearing serves as an opportunity for oversight of certain departmental programs. As you are aware, a number of trends spotted in last year's budget submission are seen again in the FY06 budget, including reversal of the trend toward parity in defense and non-defense R&D, an increase in the National Aeronautics and Space Administration, and targeted cuts towards government-industry programs.

The Department of Energy's Fossil Energy Research and Development programs make prudent investments in long-range research and development that help protect the environment through higher efficiency power generation, advanced technologies and improved compliance and stewardship operations. These activities safeguard our domestic energy security. This country will continue to rely on traditional fuels for the majority of its energy requirements for the foreseeable future, and the activities funded through this account ensure that energy technologies continue to improve with respect to emissions reductions and control and energy efficiency. The Fossil Energy Research and Development program impacts my congressional district because the coal industry is of great importance to the economy and livelihood of my constituents in Southern Illinois. As you may know, this area is rich in high-sulfur coal. The shifting of production to low-sulfur coal has cost many of my constituents high-paying jobs. Therefore, I am very pleased to learn that coal programs received an overall increase of $13 million in this year's budget. I have been a strong advocate for developing technology that focuses on carbon sequestration and am proud of the $22 million increase it received in the President's budget. However, I would like to see a future increase of advanced research and coal-based fuel programs and will work with my Democratic and Republican colleagues to accomplish these goals.

The House report language from last year's Interior appropriations bill stated that the Administration's FutureGen program, a zero-emissions coal plant, needs to be justified in future budgets before it can be considered for funding by the Committee. Therefore, I am extremely pleased the President's budget again provides $18 million dollars for the FutureGen Initiative. I urge the Committee and the Appropriators to look favorably on the Administration's and the Department of Energy's continued financial backing for FutureGen. The Administration has asked Congress to set aside an additional $257 million to fund the project in 2007 and beyond. I am committed to working with the Department of Energy, the Committee, and appropriators from both sides of the aisle to secure funding for FutureGen.

I strongly believe the FutureGen Initiative is a great national investment and Illinois stands ready to provide the resources and expertise needed to operate this

state-of-the-art coal-fired power plant. I have led the effort to locate FutureGen in Illinois, including a bipartisan effort in the House to secure funding for the project. In 2003, I hosted a roundtable discussion regarding FutureGen, focusing on the tremendous impact it will have on Illinois, along with Governor Blagojevich, both U.S. Senators, and U.S. Congressman John Shimkus. Dr. C. Lowell Miller, Director of the Office of Coal Fuels and Industrial Systems at the Department of Energy, made a presentation on the specifics of the project. Recently, the Illinois delegation sent a letter to DOE Secretary Bodman, expressing our strong support for locating the FutureGen project in Southern Illinois. Implementing the coal research program, which includes the clean coal technology program and FutureGen, is significant to my state and my district, and I look forward to hearing from Secretary Bodman about the status of the Initiative and the planned spending in this area.

Conversely, I am disappointed to see the Advanced Technology Program (ATP) was eliminated from the FY06 budget, nor provided any funds for the orderly shut down of the program. Again, the Manufacturing Extension Program (MEP) was significantly cut in the President's budget and at this level it is unclear how the MEP could function as a national network. The Illinois Manufacturing Extension Center (IMEC) has worked with over 400 small and mid-sized manufacturers. These companies reported an average cost savings of $179,000 with IMEC's assistance. In all, these manufacturers reported more than $490 million in sales, cost savings, and productivity. It is difficult to hear that the FY06 budget will leave the MEP Centers struggling to survive rather than focusing on what they do best: helping businesses increase efficiency and productivity in order to be competitive in the global marketplace.

Fossil fuels, especially coal, are this country's most abundant and lowest cost fuels for electric power generation. They are why this country enjoys the lowest cost electricity of any industrialized country. The prospects for technology advances for coal and other fossil fuels are just as promising as those for alternative energy sources, such as solar, wind, and geothermal. Therefore, I am disappointed that most accounts under Renewable Energy Resources would be cut by 11 percent. Non-fossil energy sources are extremely important initiatives and I believe we should dedicate more resources toward these programs.

I welcome our panel of witnesses and look forward to their testimony.

[The prepared statement by Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman. I greatly appreciate you calling this hearing and I am especially grateful that our distinguished witnesses have agreed to take time out of their busy schedules to answer our questions today.

The purpose of this hearing is to provide an opportunity to explore issues affecting the entire Research and Development (R&D) budget.

I, like many of colleagues, have a lot to say today about the budget we have before us. The budget includes severe cuts to almost every major government program and creates a deficit in 2006 that is likely to top $400 billion. This budget can be categorized as reckless and irresponsible.

Programs to promote efficiency and renewable energy would be reduced to about $1.2 billion or four percent. Double-digit cuts to many programs in this category were hidden by a 16 percent increase to $260 million for a program to develop hydrogen as an efficient fuel source.

The reductions prompted critics to question the White House's energy priorities. In addition, this plan would reduce the Department's extensive science and technology programs by about four percent, or $3.5 billion, while environmental cleanup activities would be reduced by eight percent, to $6.5 billion. What really disturbs me about the Department of Energy's budget is that it assumes $2.4 billion revenue in oil and gas leasing at the Arctic National Wildlife Refuge, even though Congress has never approved a plan opening this land for oil exploration.

The National Science foundation has always been near and dear to my heart. While I am pleased to see an increase in funding levels for NSF as a whole will receive a two percent increase. However, this increase cannot come at the expense of valuable programs to increase participation by under-represented groups.

The President's budget calls for a 12 percent reduction in funding for Math and Science education programs (cutting down to $737 million from $841 million in fiscal 2005) These are programs that I have long supported. This reduction leaves hundreds of thousands of children, the majority of which are in public schools, behind. The success of the world's most advanced economy depends on a strong and scientifically literate workforce composed of all races and both genders.

NSF's $5.7 billion budget authority is $3 billion short of the funding level it was pledged in 2002, when Congress authorized doubling its budget by 2007.

Members of Congress must be fiscally responsible when it comes to making decisions about our budget during these trying times. Our greatest responsibility is to leave our children a world that is safer, more prosperous, and more secure.

This budget fails that test. It is fiscally irresponsible. It is morally irresponsible. And it demonstrates a failure to lead.

[The prepared statement by Mr. Honda follows:]

PREPARED STATEMENT OF REPRESENTATIVE MICHAEL M. HONDA

Chairman Boehlert and Ranking Member Gordon, thank you for holding this important hearing today. This is an essential first step in the oversight process it is our committee's responsibility to perform. I emphasize that this is a first step, however—we must be sure to pay close attention to each of the agencies represented here, both to celebrate their successes and to make sure they are doing the job we expect them to do.

I am disappointed that the Federal Science and Technology (FS&T) Budget for Fiscal Year 2006 declines by 1.4 percent to $60.8 billion, and am concerned in particular by the significant decreases in the FS&T budgets of the Departments of Commerce and Energy, which decline by 14 percent and five percent, respectively. In a time when we are concerned about U.S. competitiveness in the global marketplace, it is troubling that we are decreasing our investment in basic research and development.

There is a troubling theme that runs through the budget requests of each of these agencies—broken promises. The Congress and the President made promises to increase the budget of NSF and to invest increasing amounts in nanotechnology, but these budget requests do not reflect those promises. And while the budget delivers on some promises made to develop facilities at the DOE national laboratories, by reducing the amount of funding for research it ensures that those facilities will not be used to their maximum benefit.

I am also disturbed by the funding cut planned for the Manufacturing Extension Program and the complete elimination of the Advanced Technology Program. A 60 percent cut for MEP produces a situation in which it is unclear how the program can continue to function as a national network. At a time when we are losing manufacturing jobs to overseas competitors, it is essential that we help out our domestic manufacturers as much as we can.

The zeroing out of the Advanced Technology Program is particularly egregious, since the budget request does not even provide the funds that will needed to execute the termination of the program, should Congress go along with such a proposition. The funds will need to be "found" somewhere else, and the most likely target are the labs of the National Institute of Standards and Technology, which could end up losing a much needed budget increase to close out ATP.

There are many questions that must be answered about this budget request, and I hope the witnesses will provide us with those answers today.

[The prepared statement by Mr. Davis follows:]

PREPARED STATEMENT OF REPRESENTATIVE LINCOLN DAVIS

Good morning. Thank you, Mr. Chairman and Ranking Member.

While I appreciate all of our witnesses today, I want to focus on the budget priorities for the Department of Energy's Office of Science.

The Office of Science budget shapes the priorities and direction of physical science and energy research in our prestigious national laboratories. Laboratories such as the Oak Ridge National Laboratory, near my District, are dependent on that budget to survive and build upon years of energy research that has resulted in greater energy efficiency and cleaner-burning fuels.

Scientists all over the country use our national laboratories to conduct important research that benefits our nation and the world. I hope that the Office of Science will re-think parts of its budget plan to show greater support for research and facilities at the national laboratories.

Thank you, Mr. Chairman. I yield back the balance of my time.

[The prepared statement by Mr. Carnahan follows:]

PREPARED STATEMENT OF REPRESENTATIVE RUSS CARNAHAN

Mr. Chairman and Mr. Ranking Member, thank you for hosting this hearing and working diligently to encourage this impressive panel to sit before us today. Members of the panel, I am pleased that all of you have decided to accept the Committee's invitation to appear and I look forward to hearing your testimony.

It is clear the research and development portions of the budget have been hit hard by administration cuts. Even the hearing charter written by the majority suggests that cuts could significantly impact U.S. leadership in science and technology and on the production of future scientists and engineers. If our nation's impressive standing in science slips, we will risk our national security—we cannot sit idly by and let this happen.

Mr. Kassinger, on a more specific note, I believe that slashing the successful Manufacturing Extension Partnership Program (MEP) by an egregious 56.5 percent should be reevaluated. I understand the tight budgetary constraints that face us in these difficult times, but I hesitate to nearly abolish the only program available to aid small local manufacturers. The network of extension centers and field offices that offer small local manufacturers process improvements, worker training, business practices, and information technology applications is unavailable elsewhere.

In my home State of Missouri, our MEP program is called the Missouri Enterprise. It has nine field offices, and has created or retained 2,449 jobs and $279,320,000 in 2003. The work that Missouri Enterprise and all MEPs is significant and I believe worth the expense. Please work to preserve this important program.

[The prepared statement by Ms. Jackson Lee follows:]

PREPARED STATEMENT OF REPRESENTATIVE SHEILA JACKSON LEE

Chairman Boehlert, Ranking Member Gordon,

I want to thank you for organizing this important hearing to discuss the federal research and development budget for the 2006 fiscal year. Clearly, you have compiled an impressive panel of witnesses from some of the top agencies affected by this budget. Let me take a moment to recognize Dr. Samuel Bodman and congratulate him on recently being unanimously confirmed by the Senate and being sworn in as the 11th Secretary of Energy earlier this month. The five panelists here represent some of the brightest and hard working minds in America and I look forward to working with all of them in the future to improve our nation's scientific and technological capabilities.

Unfortunately, while I wholeheartedly support the work of the science community, I do not believe the President's budget for R&D meets all the needs of our nation to move forward in this new century. This Administration's budget continues the same bad choices that have led to huge deficits and mounting debt during the last four years. For the third year in a row, the Administration's budget sets a record deficit, and offers no real plan to put the budget in balance. In addition to the debt it has accumulated, the Bush Administration proposes $1.6 trillion in tax cuts and a plan for Social Security privatization that can only drive the deficit up. In order to pay for small portions of these plans, the Administration plans to cut services for veterans, students, small businesses, law enforcement, health, urban and rural development, and environmental protection. Sadly, the R&D budget is not immune from these cuts and vital programs to improve the lives of Americans are left to suffer.

However, the most troubling aspect of the President's budget is that it continually omits costs and provides incomplete data, obscuring the full extent of the damage done by its policies. This budget fails to factor in the cost of the President's Social Security Privatization plan which will cost the American taxpayer $754 billion from 2009–2015. The cost to repair the Alternative Minimum Tax will be as high as $774 billion, none of which is included in the budget. Perhaps the most flagrant abuse in the President's budget is that it does not include the realistic costs for Iraq and Afghanistan, which based on a CBO analysis, will be as much as $384 billion over ten years. Sadly, the budget for R&D continues the use of this fuzzy math through the selective use of earmarks. When it suits the Administration to count earmarks, such as when calculating budget increases from 2001–2005, they do so. When it doesn't suit them to count earmarks, such as when claiming that one of their budget cuts isn't a real cut when the earmarks are left off, they don't. These kinds of misleading budget tricks are not only wrong, but they are in fact immoral. This is the American taxpayers money we are talking about here and whether we are talking

about the federal budget as a whole, or just the R&D budget, the American people deserve to have a fair and accurate portrayal of where there tax dollars are going.

I am disappointed to find that the President's budget proposal will cut the science funding for R&D. The so-called increase in funding is actually merely 0.56 percent, which in fact is less than the two percent expected rate of inflation. So in real spending power, the federal R&D funding would decline. In addition, nearly all of this meager increase is targeted for weapons development. If you eliminate weapons development from the equation, the federal research investment decreases by 1.4 percent in the President's request. Government-wide funding for basic research would decrease by 1.2 percent and funding for applied research would decrease by $3 million. Furthermore, these numbers do not take into account the two percent expected rate of inflation; so in its actual application the cuts are steeper than the numbers would indicate.

I am also appalled by the Administration's effort to basically destroy the Manufacturing Extension Program (MEP) and the Advanced Technology Program (ATP) in the National Institute of Standards and Technology (NIST) budget. The MEP is a successful federal/State partnership designed to assist small manufacturers retain their competitive edge. The Administration's request of $46.8 million is less than one-half of what is required to maintain a fully operational national network of MEP Centers. MEP helps smaller manufacturers take advantage of the latest technology. Similarly, the ATP provides grants to companies for pre-competitive research; this program is now being completely eliminated from the Bush Administration budget. This is no way to help the crisis we face in the great loss of manufacturing jobs in this nation. In my State of Texas alone, we have lost 188,000 manufacturing jobs since the beginning of the Bush Administration. In spite of these tremendous job losses, this Administration chooses to basically eliminate two successful technology programs and I find that kind of fiscal mismanagement to be inexcusable.

I am also greatly disappointed to find that promises made regarding funding for NSF have been broken once again. Three years ago, the President signed an authorization bill doubling NSF funding over five years. Unfortunately, the requests for NSF since the signing ceremony have been lackluster at best, as they would produce a doubling of funding in about 25 years. As a result of these deficient funds NSF is $5.8 billion behind its target. The balance between the physical sciences and health sciences remains highly skewed. In 2002, this Administration signed a bill to correct that imbalance but the Administration has failed to follow through on that obligation. It's sad to think that so many promises made by this Administration are broken in this highly flawed budget proposal.

The fact that this Administration has decided to cut $1.3 million for cyber security funding under the Department of Homeland Security is appalling to me. Cyber threats to our nation will only continue to grow as time goes on and as technologies become available. Cyber security is an area where the Federal Government must stay one step ahead of those who hope to threaten our nation. Cyber security is so urgent because terrorists or other criminals can attack our technological infrastructure from thousands of miles away and can be nearly untraceable to authorities. The United States should be at the forefront of cyber security in the world and that requires an increase in funding, not the decrease we see here.

Despite the great deals of flaws in the President's budget and the lack of funding I see for R&D, I remain hopeful. I remain hopeful because we still have many tremendous R&D programs that can impact the lives of the American people in so many different ways. I look forward to seeing our scientific community continue to make advances and improve upon our technological infrastructure. So, I look forward to hearing from our distinguished panel about how their agencies can accomplish these lofty standards.

Chairman BOEHLERT. So with that, let me thank all of the very distinguished witnesses. Secretary Bodman has been on the job two weeks, and he has been testifying for three weeks, so how do you figure that one? And Dr. Marburger, we are in regular consultation with you, and I thank you so much for the fine job you do for the President and the country. And Mr. Kassinger, it is good to have you back. And Dr. Bement, you know I am an unabashed cheerleader for the agency that you represent. And Dr. McQueary, we created your job and the whole notion that there should be someone like you in a very sensitive position within the Department of Homeland Security. And I am so pleased to have you.

So we have before us, ladies and gentlemen of this committee, some of the Nation's finest public servants. They are trying to deal with a very difficult budget scenario, and if the truth be known, I can guarantee you each of our witnesses would come up with a wish list that would contain a lot more than they got. But we have got to deal with what is requested, and then we will do our level best to assist in getting more in the right areas.

With that, let me introduce the panel: Dr. John Marburger, Director of the Office of Science and Technology Policy, affectionately known as the Science Advisor to the President; Dr. Samuel W. Bodman, the newly-installed Secretary of Energy; Dr. Arden Bement, Director, National Science Foundation; Mr. Theodore W. Kassinger, Deputy Secretary of Commerce; and Dr. Charles E. McQueary, Under Secretary for Science and Technology, Department of Homeland Security.

You know the drill. You are experts. We would ask you to try to confine your opening statement to five or six minutes. I am not going to be arbitrary. It is too darn important what you are talking about, and you are the only panel. But keep in mind, the less you speak in your formal presentation, the more opportunity we have for a good, healthy exchange. And we both might benefit from that.

With that, Dr. Marburger.

STATEMENT OF DR. JOHN H. MARBURGER, III, PRESIDENT'S SCIENCE ADVISER; DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Dr. MARBURGER. Thank you, Chairman Boehlert, and Ranking Member Gordon, and Members of the Committee. I am pleased to appear before you once again to discuss the President's R&D budget for fiscal year 2006.

As you know and have said in your opening remarks, despite the exceptional pressure on this budget, it does propose an increase in federal R&D funds. The budget maintains a strong focus on winning the war against terrorism while moderating the growth in overall spending. And this focus is reflected in the proposed R&D investments.

The Administration has made difficult choices, and it has maintained the strength in priority areas, such as nanotechnology, information technology, the hydrogen initiative, and space exploration. Furthermore, while overall non-security discretionary spending is reduced by one percent, non-security R&D is not correspondingly diminished. The fiscal year 2006 proposal preserves the substantial increases made, and I might add, with your support, Mr. Chairman, and that of your committee, during the first term of this Administration.

My written testimony does summarize the extraordinary growth of R&D funding during the past four years, and it is from that plateau of excellence that we view this budget proposal.

This budget requests $132.3 billion for federal R&D, an increase of $733 million over the current year's record R&D budget. The budget allocates 13.6 percent of total discretionary outlays to R&D, the highest level in 37 years. Non-defense R&D accounts for 5.6 percent of the total discretionary outlays, an amount significantly greater than the five percent average over the past three decades.

In my oral testimony, I will just briefly highlight the agency budgets, Mr. Chairman, and describe the priorities that shape them. And my colleagues on the panel have much more to say about the details for their agencies, as you know, so let me simply begin with the Department of Defense.

The fiscal year 2006 request is more than $70 billion, of which $5.5 billion is for DOD basic and applied research. This is $900 million less than the fiscal year 2005 enacted level in this category, but it is greater than the fiscal year 2005 enacted level minus Congressional earmarks, which are over a billion dollars for this agency, and $250 million more than the fiscal year 2005 presidential request.

And I would like to take this opportunity to express my concern briefly that investments in defense R&D are discounted by some science budget commentators as somehow less important than nondefense science. That is wrong. National security related science and technology drive innovation and strengthen economic competitiveness in much the same way as technical work for other purposes. The technology required for national and homeland security is nearly always dual use and benefits civilian as well as military products.

Let me move on to homeland security.

Science and technology at the Department of Homeland Security will increase from $1.2 billion to $1.5 billion, including $227 million to fund the creation of an important new Domestic Nuclear Defense Office, DNDO.

At NIH, the fiscal year 2006 request is $28.8 billion for biomedical research, a $196 million increase from fiscal year 2005 enacted.

In NSF, NSF's budget, as you noted, Mr. Chairman, would increase by 2.4 percent to $5.6 billion in fiscal year 2006. Investments in this key science agency strengthen U.S. science across the board and play an exceptionally important role in America's unique system of university-based science and engineering research.

The Department of Energy Office of Science: this budget provides $3.5 billion for DOE's Office of Science, a $57 million reduction after removing $80 million in earmarks. This reduction does not imply diminished priority for Office of Science operations, but reflects various construction and procurement adjustments. Over a five-year period, this Administration has invested more than $17 billion in the Office of Science basic research at DOE, which is 14 percent greater than the previous five-year period in constant dollars.

NASA: the request for NASA is $16.46 billion, a 2.4 percent increase from 2005, reflecting a strong commitment by the Administration to the missions of this agency. The fiscal year 2006 budget request also makes some hard decisions in NASA, trading off some products with high technical risks to maintain others with high scientific value. And I know you will hear more about that in your hearing.

The Department of Commerce: the 2006 budget provides over $1 billion for R&D at the Department of Commerce, including $361 million for oceanic and atmospheric research at NOAA, an 11 percent reduction due mostly to the effect of earmarks and an increase

of eight percent in NIST's core programs, which actually translates to 22 percent after earmarks are excluded.

In EPA, the 2006 S&T request, science and technology request, is $792 million, a two percent increase over fiscal year 2005 even before removing $70 million in earmarks.

The Department of Transportation, and this is the last agency I will mention specifically, the fiscal year 2006 budget request for highway-related research is $543 million, $23 million less than 2005 before removing significant earmarks.

Mr. Chairman, you mentioned interagency initiatives, among them the Networking and Information Technology R&D program. With President Bush's fiscal year 2006 budget request of $2.2 billion for this program, the investment in this area over five years will total more than $10.4 billion.

The National Nanotechnology Initiative: the President's budget provides for over $1 billion for this multi-agency initiative, bringing the total investment under this Administration to $4.7 billion.

Climate change: the fiscal year 2006 budget proposes approximately $1.9 billion to fund the Climate Change Science Program, which is virtually the same as 2005 despite reductions in NASA due to reprioritization of programs. With this request, the Administration will have invested more than $9 billion over five years to improve our understanding of the global climate system.

The Hydrogen Fuel Initiative receives $260 million, a 16 percent increase from 2005. The initiative remains on track to meet President Bush's five-year, $1.2 billion commitment to hydrogen research and development announced in his 2003 State of the Union address.

And finally, in homeland security, the Department of Homeland Security Science and Technology Directorate funding will increase from $1.1 billion to $1.4 billion. R&D is focused on countering chemical, biological, radiological, nuclear, and other catastrophic threats. I mention DHS again in this context of interagency cooperation, because many agencies contribute to our domestic safety.

Mr. Chairman and Members of the Committee, America's science and technology capabilities are the envy of the world. I believe the President's fiscal year 2006 budget proposal maintains and selectively strengthens these capabilities in areas that are important to the Nation's national homeland and economic security, and I look forward to responding and answering your questions.

[The prepared statement of Dr. Marburger follows:]

PREPARED STATEMENT OF JOHN H. MARBURGER, III

Chairman Boehlert, Ranking Minority Member Gordon, and Members of the Committee, I am pleased to appear before you once again to discuss the President's research and development (R&D) budget. As I have said many times before, I greatly appreciate the effective working relationship between our office and your committee, which I believe has resulted in good outcomes for the Nation's science and technology enterprise.

The budget this year is subject to considerable pressure, as you know, and the President is committed to cutting the budget deficit in half by 2009. These factors make this year's budget proposal the tightest in nearly two decades.

Despite these pressures, federal R&D funds will increase in the President's fiscal year (FY) 2006 budget. The Budget maintains a strong focus on winning the war against terrorism, while moderating the growth in overall spending, and this focus is reflected in the proposed R&D investments. The Administration has also maintained high levels of support for priority areas such as nanotechnology, information

technology, the hydrogen initiative, and space exploration. Furthermore, while overall "non-security" discretionary spending is reduced by one percent, "non-security" R&D is not correspondingly diminished. The FY06 proposal preserves the substantial increases made—with your support—during the first term of this Administration. This treatment of R&D is consistent with the President's commitment to science and technology and the vital role they play in meeting the Nation's goals for national and economic security and the quality of life.

Comparing R&D investments in this Administration with investments in other top national priorities demonstrates this commitment: From FY01 to this FY06 proposal, federal spending on Department of Homeland Security activities will have increased 83 percent; Department of Education programs are up 40 percent; and Department of Defense spending is up 37 percent. At the same time total federal investment in R&D will have increased 45 percent. The percentage increase in R&D has been second only to the increase in the Department of Homeland Security during President Bush's first five budget years (and I might add, during Chairman Boehlert's five years as Chairman of this committee).

This historic increase in R&D has not been confined to a single agency or field of science. It does include a significant investment in defense R&D, whose value to the Nation's technical enterprise extends well beyond the defense establishment. Defense R&D funds significant university and private sector research, supports a large number of scientists, engineers and technical experts, and is instrumental in training and recruiting the next generation of technical talent for the Nation. Non-defense R&D, however, has also benefited from similar large increases during the past five years.

I am emphasizing these historical data to provide a context for this year's request. Within a pattern of overall budget constraint, funds are provided that we believe are appropriate to maintain and refine the large program increases of previous years. Within the pattern of detailed agency budgets, priorities have been established and choices made that preserve the Nation's investment in the critically important assets of science and technology.

THE PRESIDENT'S FY 2006 R&D BUDGET

The President's FY 2006 Budget requests $132.3 billion in Federal Research and Development funds, an increase of $733 million over this year's (2005) record R&D budget. The Budget allocates 13.6 percent of total discretionary outlays to R&D—the highest level in 37 years. Non-defense R&D accounts for 5.6 percent of total discretionary outlays, an amount significantly greater than the 5.0 percent average over the past three decades.

While non-defense discretionary program budget authority is reduced by 0.26 percent in this proposal, non-defense R&D funds are increased by 0.74 percent. The category of Basic Research is maintained near its historically high level at $26.6 billion in FY 2006, slightly down from $26.9 billion in FY 2005.

Not all programs can or should receive equal priority, and this budget reflects priority choices consistent with recommendations from numerous expert sources. In particular, this budget is informed by recommendations from the President's Council of Advisors on Science and Technology (PCAST), and reflects an extensive process of consultation among the federal agencies, the Office of Management and Budget (OMB), and the Office of Science and Technology Policy (OSTP).

As in previous years this R&D budget highlights collaborations among multiple federal agencies working together on broad themes. I will describe some individual agency highlights, followed by the five multi-agency R&D priorities highlighted in the President's FY 2006 Budget: Networking and Information Technology R&D; National Nanotechnology Initiative; Climate Change Science Program; Hydrogen Fuel Initiative; and Homeland Security R&D.

AGENCY BUDGET HIGHLIGHTS

Department of Defense (DOD):

DOD's FY 2006 R&D budget is over $70 billion. These funds will help to transform our nation's military capabilities to meet future threats and to fight the Global War on Terror. They also will improve DOD's capabilities against weapons of mass destruction, including new laboratory facilities, detection systems, and protective measures against advanced biological and chemical weapons. From FY 2006 to FY 2011, $764 million is budgeted to upgrade infrastructure at the U.S. Army Medical Research Institute of Infectious Disease (USAMRIID), a critical component of this nation's federal biodefense effort. USAMRIID not only works to protect men and women in uniform, it also responds to emerging infectious diseases that threaten our nation (i.e., SARS, West Nile, Hantavirus and Ebola).

I want to take this opportunity to express my concern that investments in defense R&D are often discounted by science budget observers as somehow less important than non-defense science. That is a serious misconception. Weapons systems development and other national security-related discovery and technology creation drive innovation and strengthen economic competitiveness in much the same way as technical work for other purposes. The technology required for national and homeland security is nearly always "dual use" and benefits civilian as well as military products.

Because science, mathematics, and engineering (SME) are vital disciplines to our national defense, a formal DOD Science, Mathematics and Research for Transformation (SMART) Defense Scholarship Pilot Program was established in FY 2005. The purpose is to promote the education, recruitment and retention of U.S. citizens in SME studies deemed critical to national defense. DOD also uses other scholarship and fellowship programs (i.e., the National Defense Science and Engineering Graduate (NDSEG) fellowship program) to sponsor graduate students. Funding for NDSEG has increased to support 200 new students annually by FY 2007.

A total of $5.5 billion is provided for DOD basic and applied research. This is $905 million less than the FY 2005 enacted level in this category, but greater than the FY 2005 enacted level minus Congressional earmarks (over $1 billion)—and $250 million more than the FY 2005 request. This budget request does not continue FY 2005 earmarks beyond FY 2005, instead increasing programs of priority to military leaders. Earmarks are not consistent with using funds most efficiently to target military priorities or to support the best research for military purposes. The Administration is prepared to work with Congress to achieve consistency in Legislative and Executive priorities to fund the best scientific research possible to support our military forces.

Department of Homeland Security (DHS):

DHS-wide funding for science and technology (including TSA, Coast Guard and Secret Service) will increase from $1.2 billion to $1.5 billion (FY 2005 to FY 2006). Within that total, DHS Science and Technology (S&T) Directorate funding will increase from $1.1 billion to $1.4 billion (FY 2005 to FY 2006). R&D is focused on countering chemical, biological, radiological, nuclear, and other catastrophic threats.

The President is requesting $227 million in DHS to fund the creation of a Domestic Nuclear Defense Office (DNDO) whose responsibility will be to develop a comprehensive system to detect and mitigate any attempt to import or transport a nuclear explosive device, fissile material, or radiological material intended for use within the U.S. The DNDO will enhance and coordinate the nuclear detection efforts of Federal, State and local governments and the private sector to ensure a managed, coordinated response. At the federal level, the DNDO will draw representatives from agencies involved with nuclear defense research. They will analyze current nuclear defense R&D investments and create a prioritized road map of future research that will address current gaps and deficiencies. This will allow for the development of a coordinated plan, while at the same time ensuring that critical gaps are addressed and redundancies avoided, and maintaining the integrity of each agency's current unique missions.

The S&T Directorate is leading the Administration effort to develop new countermeasures to protect civilian and commercial aircraft against man portable air defense systems (MANPADS). In the 2006 Budget, the President has requested $110 million to continue DHS's Counter–MANPADS program. This $49 million increase over last year's budget will go to funding phase II of the program in which systems developed by BAE Systems and Northrup Grumman will undergo rigorous testing and evaluation.

The University Programs Office within the S&T Directorate has established three Homeland Security Centers of Excellence (Texas A&M, USC, and the University of Minnesota) and has just awarded a grant to the University of Maryland to become the fourth Center of Excellence. This program will continue to operate and expand to seven Centers with a requested FY 2006 budget of $63.6 million, which is 90 percent of the current year budget. The fellowship program will continue at the FY 2005 level.

National Institutes of Health (NIH):

Following fulfillment of the President's commitment to complete the five-year doubling of the agency's budget, the FY 2006 request is $28.8 billion, a $196 million increase from FY 2005 enacted. The recent budget doubling changes the scale of NIH operations and requires new management mechanisms to better integrate, coordinate and focus research, especially interdisciplinary research, across NIH's 27 Institutes and Centers (ICs).

Since 2001, the NIH Budget has increased by $8.2 billion or 40 percent. NIH is committing $333 million towards Roadmap initiatives, an increase of $98 million over the FY 2005 enacted level. The Roadmap is a part of the total NIH budget, and is important as a means to optimize the effectiveness of the entire research portfolio, focusing on efforts that no single or small group of ICs could address. Roadmap initiatives will provide the tools to transform the content and process of medical research over the next decade.

Other highlights include $2.9 billion for AIDS research, including the highest priority goal of development of an AIDS vaccine, and almost $1.8 billion for Biodefense research and development activities. In addition, NIH has recently issued an interim final rule changing the way employee conflict of interest is regulated. We believe this action will greatly increase public confidence in the integrity of the NIH intramural research program. NIH also has proposed an NIH Public Access Policy, which provides the public with better access to research publications resulting from NIH-funded research. This is accomplished by establishing a comprehensive, searchable electronic archive of NIH-funded research publications, providing publicly available access to all.

National Science Foundation (NSF):

Funds are requested to increase the budget for NSF by 2.4 percent to $5.6 billion in FY 2006, 26 percent above 2001's $4.4 billion level. Similar investments in the past have yielded important scientific discoveries, which boost economic growth and enhance Americans' quality of life.

NSF leads two Administration priority research areas that promise to strengthen the Nation's economy: the National Nanotechnology Initiative (NNI) and the Networking and Information Technology R&D program (NITRD). NSF-funded nanotechnology research, proposed at $344 million in FY 2006, a 1.6 percent increase over 2005 and 129 percent since 2001, has advanced our understanding of materials at the molecular level and has provided insights into how innovative mechanisms and tools can be built atom by atom. This emerging field holds promise for a broad range of developing technologies, including higher-performance materials, more efficient manufacturing processes, higher-capacity computer storage, and microscopic biomedical instruments and mechanisms. NSF's investments in NITRD, funded at $803 million in 2006, a one-percent increase over 2005 and 26 percent since 2001, support all major areas of basic information technology (IT) research. NSF also incorporates IT advances into its scientific and engineering applications, supports using computing and networking infrastructure for research, and contributes to IT-related education for scientists, engineers, and the IT workforce.

Growing concerns about the vulnerability of computers, networks and information systems have prompted increased NSF investments in cyber security research, education and training. The FY 2006 Budget provides $94 million for these activities.

Every research discipline in the agency is increased between one to 3.5 percent, allowing the grant funding rate to be restored to 21 percent (from 20 percent in 2005). Funding is provided for the five Major Research Equipment (MRE) projects already approved (Atacama Large Millimeter Array, EarthScope, the IceCube Neutrino Observatory, the Rare Symmetry Violating Processes (RSVP) installation, the National Ecological Observatory Network (NEON), and the Scientific Ocean Drilling Vessel).

In order to most effectively and efficiently support the Nation's polar research activities in Antarctica, funding for three polar icebreakers is being transferred from the U.S. Coast Guard to NSF ($48 million). In the future, this will permit NSF to define the options for refurbishment or replacement of two of the ships, as well as operational options for the third (Arctic) icebreaker.

The FY 2006 Budget will continue NSF's efforts to prepare U.S. students for the science and engineering workforce, with funds for 4,600 graduate research fellowships and traineeships. NSF provides annual stipends in these programs of $30,000, which is significantly higher than the average stipend of $18,000 in 2001.

Department of Energy (DOE):

The FY 2006 Budget provides $3.5 billion for DOE's Office of Science, a $57 million reduction after removing $80 million in earmarks. This reduction does not imply diminished priority for Office of Science operations, but reflects various construction and procurement adjustments. Over a five year period this Administration has invested more than $17 billion in Office of Science basic research at DOE, 14 percent greater than the previous five-year period in constant dollars.

The Department has a broad program of basic research and operates a unique suite of major scientific user facilities in support of its missions. The FY 2006 Budget provides funding to complete construction and begin operation of the Spallation

Neutron Source—to become the world's preeminent facility for materials studies—and four new nanoscale science research centers. $25 million is included for the development of a High-end Computing (HEC) Leadership Class Computer, bringing the total three-year investment to $100 million. $83 million begins construction of the Linac Coherent Light Source—a revolutionary new facility that will open entirely new realms of discovery in the chemical, materials, and biological sciences. Basic materials and chemistry research in support of the Hydrogen Fuel Initiative is enhanced to $33 million and assuming that international partners reach a timely site decision, $46 million is available to begin fabrication of U.S. contributions to the International Thermonuclear Experimental Reactor (ITER). These investments will allow U.S. scientists to remain at the forefront of their fields.

National Aeronautics and Space Administration (NASA):

During the year since the President outlined a bold vision for sustained and affordable human and robotic exploration of space, NASA has restructured its organization and reprioritized its programs. The current human spaceflight programs, Shuttle and International Space Station, are focusing research and technology development on enabling the vision, while requirements are being established for the next generation of space transportation. An exciting array of space science missions are being planned that will enhance our understanding of the solar system, including interactions between the Earth and the space environment, and building observatories that will peer further into the cosmos to understand the origin of the universe, its structure, evolution and destiny.

The President's FY 2006 Budget request for NASA is $16.456 billion, a 2.4 percent increase from 2005, reflecting a strong commitment by the Administration to pursue the exploration vision. The FY 2006 Budget request also makes some hard decisions, canceling some projects with high technical risk and others whose cost estimates would have led to the certain cancellation and delay of several other important programs. The budget request maintains NASA's focus on exploration and science while strengthening the long-term foundation for continued success.

The budget requests about $3.2 billion in FY 2006 for new vehicles and technologies to enable sustained human and advanced robotic exploration far from Earth. NASA has identified the major requirements for a Crew Exploration Vehicle that will carry astronauts to the Moon. NASA plans to perform risk reduction tests in 2008 and stage its first crewed flight by 2014. NASA will also continue pursuing nuclear technologies for space applications, optical communications for high data rate connectivity to space probes, radiation shielding, and other advanced technologies to support the exploration vision. In addition, NASA is pursuing innovative means to engage private industry including offering space prizes to spur innovation.

The budget requests approximately $5.5 billion in FY 2006 to continue advancing our scientific understanding of the Sun, Earth, and planets and to inform decisions regarding appropriate human exploration missions. NASA will also build on its legacy of revolutionizing astronomy by continuing current operations of space telescopes such as Hubble, Chandra, and Spitzer while planning for the next generation of spacecraft that will enhance our ability to find planets around other stars, peer deep into the history of the universe, and improve our understanding of its structure.

The FY 2006 Budget continues to fund critical investments in Earth science satellites, technologies, and research. NASA will continue to play a major part in the interagency Climate Change Science Research Program, and contribute to the international initiative on the Global Earth Observing System of Systems.

The budget requests approximately $6.4 billion in FY 2006 for operating the Space Shuttle and continuing assembly and operations of the International Space Station. NASA is examining configurations that meet the needs of both the new space exploration vision and our international partners using as few Shuttle flights as possible to enable Shuttle retirement by 2010, following completion of its role in ISS assembly. In concert with the new vision, NASA will refocus U.S. Space Station research on activities that prepare human explorers to travel beyond low Earth orbit, such as developing countermeasures against space radiation and understanding long-term physiological effects of reduced gravity.

As the United States implements the Vision for U.S. Space Exploration, the Administration recognizes the value of effective cooperation with Russia to further our space exploration goals. At the same time, we have to appropriately reflect U.S. nonproliferation policy and objectives in our relationship with Russia. The Administration is thus interested in seeking a balanced approach that continues to protect our nonproliferation goals while advancing potential U.S. cooperation with Russia on the Vision for U.S. Space Exploration. Such a balanced approach must include the Iran Nonproliferation Act of 2000 (INA), which currently complicates cooperation

with Russia on the International Space Station (ISS), and will also have an adverse impact on cooperation with Russia on our future space exploration efforts related to human space flight. To that end, the Administration looks forward to working with Congress to ensure that the Vision for U.S. Space Exploration is able to succeed while remaining fully consistent with broader U.S. national security and nonproliferation goals.

Department of Commerce:

The 2006 Budget provides over $1 billion for R&D at the Department of Commerce.

National Institute of Standards and Technology (NIST) "core" programs receive $485 million, an increase of eight percent over 2005 (22 percent after earmarks are excluded). The Administration continues to insist on the highest priority for NIST lab research because it is producing the scientific foundation for new technologies and providing essential technical support through its standards activities for industrial development and commercialization of new and emerging technologies. The FY 2006 request is a 40 percent increase over 2001. NIST is proposing a new strategic initiative in 2006, Advances in Manufacturing, funded at $19.6 million, and a new NIST business plan is being developed to better focus and address high leverage areas of advanced manufacturing, nanotechnology, quantum computing, homeland security, and biosystems and health.

The FY 2006 Budget again proposes to terminate the Advanced Technology Program (ATP). The Administration believes firmly that other NIST research and development programs have profoundly greater impact than ATP, and are essential to the continued technical leadership of U.S.-based businesses, American workers, and the domestic economy. The Budget proposes to fund the Hollings Manufacturing Extension Partnership Program at $47 million, a 50-percent reduction from the 2005 grant level. The Administration's approach will maintain a strong national network of centers while focusing funding based on centers' performance in providing information and consulting services to small manufacturers. The program has also augmented funding through expanding partnerships with other agencies and institutions. Given this new operating environment, the Administration believes the program has evolved to a stage at which less reliance on direct appropriations is required.

For the National Oceanic and Atmospheric Administration (NOAA), the FY 2006 Budget provides $361 million for Oceanic and Atmospheric Research (OAR), an 11 percent reduction from 2005 enacted, due mostly to earmarks. This investment provides for ongoing research on climate, weather, air quality, and ocean processes. For NOAA programs that support the climate change science program, $181 million is provided, and Sea Grants are sustained at the 2005 level of $61 million.

To improve efficiency, the Budget also streamlines administrative layers within the Technology Administration (TA). The Budget reflects TA's intent to evaluate its current operating practices and incorporate methods to improve the effectiveness of its operations.

Environmental Protection Agency (EPA):

The FY 2006 EPA S&T request is $792 million, a two percent increase over FY 2005, even before removing $70 million in earmarks. This investment supports core Agency programs and strengthens the application of science to EPA regulatory actions and other programs.

The Administration is directing $20 million of S&T funding to a new pilot program within EPA that the program offices (e.g., Water, Office of Solid Waste and Emergency Response, Air) would then use to fund applied research in the Office of Research and Development (ORD). This is intended to improve the use of ORD (to avoid duplicative program efforts), coordination between the program offices and ORD, and responsiveness and accountability. This program contributes to the overall increase in S&T funding.

$79 million in new funding will support homeland security projects and research at EPA related to water security monitoring and surveillance, post-incident building and environmental decontamination, and Environmental Laboratory Preparedness and Response.

The FY 2006 Budget requests approximately $65 million for the Science to Achieve Results (STAR) program, which includes a decrease in exploratory research grants. Given the overall tightness of EPA's budget (-6 percent from 2005 enacted), and the need to fun core programmatic needs, STAR grants, which cannot focus on EPA program needs, were reduced.

Department of Transportation (DOT):

The FY 2006 Budget request for highway-related research is $543 million, $23 million less than 2005, before removing significant earmarks. Highway research includes the Federal Highway Administration's transportation research and technology contract programs, National Highway Traffic Safety Administration research and analysis, and Federal Motor Carrier Safety Administration research and technology.

The 2006 request for Federal Aviation Administration (FAA) Research, Engineering and Development is $130 million, virtually the same as 2005's $131 million. In 2003, Congress created the Next Generation Air Transportation System Joint Planning and Development Office (JPDO) [Public Law 108–176] to coordinate the goals, priorities, and research activities across the Federal Government relative to the air transportation system. The JPDO vision was articulated in their Integrated Plan released on December 12, 2004 and the research needs identified to date are being addressed through prioritization and leveraging of existing funds at FAA, NASA, and DOD.

PRIORITY INITIATIVES

The 2006 budget highlights priority interagency initiatives described briefly below. These initiatives are coordinated through the National Science and Technology Council (NSTC) for which my office has responsibility for day-to-day operations. The Council prepares research and development strategies that cross agency boundaries to form a consolidated and coordinated investment package.

Networking and Information Technology R&D—With President Bush's FY 2006 Budget request of $2.2 billion for the Networking and Information Technology R&D (NITRD) program, the investment in this area over five years will total more than $10.4 billion. Research in networking and information technologies underpins advances in virtually every other area of science and technology and provides new capacity for economic productivity. Through active coordination, NITRD agencies mutually leverage resources to make broader advances in networking and information technology than any single agency could attain.

- NSF continues to provide the largest share of federal NITRD funding, reflecting the Foundation's broad mission as well as its leadership role in coordinating NITRD activities. The FY 2006 request for NSF is $803 million, an $8 million increase from the 2005 estimate.
- High-end computing continues to be a major focus within the NITRD program. In FY 2004, the interagency High End Computing Revitalization Task Force (HECRTF) produced the *Federal Plan for High-End Computing,* which describes a roadmap for progress in core technologies for high-end computing, mechanisms for improving access to high-end computing resources, and strategies for improving federal procurement and coordination of high-end systems. The FY 2006 budget reflects the continuation of NITRD activities that are consistent with recommendations described in the *Federal Plan,* such as investments in new high-end systems by NASA and DOE's Office of Science.
- NASA continues to emphasize high-end computing within its NITRD portfolio through the recently-completed acquisition of the *Project Columbia* supercomputer, a portion of which NASA plans to make available to other federal users. Following completion of the acquisition of *Columbia,* NASA's expenditure in high-end computing is normalizing at a lower level.
- DOE's Office of Science has also committed to operate their new *Leadership Class Computing* facility at the Oak Ridge National Laboratory as a national user facility. DOE's FY 2006 request of $25 million for the Leadership facility brings that federal investment to $100 million.

National Nanotechnology Initiative—President Bush's FY 2006 Budget provides over $1 billion for the multi-agency National Nanotechnology Initiative (NNI), bringing the total NNI investment under this Administration to $4.7 billion. This sustained investment will advance our understanding of the unique phenomena and processes that occur at the nanometer scale and expedite the responsible use of this knowledge to achieve advances in medicine, manufacturing, high-performance materials, information technology, and energy and environmental technologies.

- The largest investments continue to be made by NSF where the FY 2006 NSF request is $344 million, an increase of $6 million over the 2005 estimate.
- DOE contribution to the initiative ramps up dramatically with commencement of operations in four of its five new major Nanoscale Science Research Centers located across the country. The Centers will provide research equip-

ment and infrastructure that will be broadly available to researchers from across the scientific research community. Construction completion keeps total DOE NNI spending flat in FY 2006, but a portion of construction roll-off funds are made available for operational support.

- The FY 2006 request of $147 million by HHS includes programs at NIH emphasizing nanotechnology-based biomedical advances occurring at the intersection of biology and the physical sciences, such as the National Cancer Institute's Alliance for Nanotechnology in Cancer, and at the National Institute of Occupational Safety and Health (NIOSH) that address implications and applications of nanotechnology for health and safety in the workplace.
- With the addition of NIOSH, 11 federal agencies currently fund nanotechnology research and development under the NNI, and another 11 participate in coordination. Agencies that have joined the NNI as participants over the past year include the U.S. Patent and Trademark Office and the Consumer Product Safety Commission, indicating the increasing importance of commercialization activities.

Climate Change Research and Development—The FY 2006 Budget continues strong support for the Climate Change Science Program (CCSP) and the Climate Change Technology Program (CCTP).

- The CCSP budget continues to support the goals outlined in the CCSP Strategic Plan, which was released in July 2003. Beginning in FY 2006, CCSP will formally track the expected actions, deliverables, and milestones for each of its programs in order to assess overall performance.
- The FY 2006 Budget proposes approximately $1.9 billion to fund CCSP, virtually the same as 2005 despite reductions in NASA (-$102 million) due to re-prioritization of programs. With this request, the Administration will have invested more than $9 billion over five years to improve our understanding of the global climate system.
- The FY 2006 Budget provides approximately $2.9 billion for the U.S. Climate Change Technology Program (CCTP), which supports research, development, deployment, and voluntary programs to reduce greenhouse gas emissions via renewable energy, fossil energy and nuclear energy, efficiency improvements, and carbon sequestration.
- In 2005, the CCTP will publish a draft Strategic Plan and solicit comments from the scientific community and the public. The CCTP will also identify within its portfolio a subset of National Climate Change Technology Initiative (NCCTI) priority activities.

Hydrogen Fuel Initiative—The Hydrogen Fuel Initiative (HFI) seeks to develop new science and technology to support a major shift toward the use of hydrogen as an energy medium, particularly for transportation. The FY 2006 Budget for HFI is $260 million, $35 million (16 percent) greater than the FY 2005 level. The Initiative remains on track to meet President Bush's five-year, $1.2 billion commitment to hydrogen research and development announced in his 2003 State of the Union address. Some highlights include:

- $20 million, an $11 million (122 percent) increase over FY 2005, will fund the *Nuclear Hydrogen Initiative.* This initiative will conduct the R&D on enabling technologies, demonstrate nuclear-based hydrogen production technologies, and study potential hydrogen production schemes to support the President's vision for a future Hydrogen economy.
- $33 million for fundamental research within DOE's Office of Science. This research seeks to overcome key technical hurdles in hydrogen production, storage, and conversion, by seeking revolutionary breakthroughs in areas such as non-precious-metal catalysts, high-temperature membrane materials, multifunctional nanoscale structures, biological and photoelectrochemical hydrogen production, and precision manufacturing processes.
- *Congressional earmarking is slowing progress on HFI,* however, and may jeopardize the ability of the Administration to achieve its goal of a 2015 decision by industry to commercialize fuel cell vehicles and infrastructure. In 2005, DOE's *Hydrogen Technology Program,* a key component of HFI, received 17 earmarks totaling $37 million, about 40 percent of the program's funding.

Homeland Security—Technology continues to help secure our nation against terrorism. Research and development over the past three years in detectors against weapons of mass destruction (WMD) threat agents, medical countermeasures to improve public health preparedness and to protect our nation's food and livestock, and

advances in protecting the First Responders are moving from laboratory to operational use. The President's FY 2006 Budget continues an aggressive investment in research, development, and the research infrastructure so as to further enhance our nation's security. Priority research areas include:

- $227 million to fund the creation of a *Domestic Nuclear Defense Office* (DNDO) in DHS, whose responsibility will be to develop a comprehensive system to detect and mitigate any attempt to import or transport a nuclear explosive device, fissile material or radiological material intended for illicit use within the U.S.
- $1.8 billion to the Department of Health and Human Services (HHS) to fund research and development of countermeasures against biological, chemical and radiological threat agents.
- $596 million is allocated for the U.S. Department of Agriculture, HHS and DHS to improve food and agriculture defense. This includes funding for research on exotic and emerging diseases of plants and animals and to prevent and detect food contamination, expanding and improving laboratory facilities, and enhancing disease monitoring, surveillance and vaccine storage.
- $94 million will fund new and ongoing research at EPA related to their role in water security and post-incident decontamination. Systems for monitoring and surveillance of terrorist threat agents in drinking water will be piloted in several U.S. cities. Decontamination capabilities will be strengthened by testing new cleaning methods, systems and antimicrobial products for buildings and outdoor areas and by conducting risk assessment work to support decontamination/revision of cleanup guidance goals.

MANAGING THE FEDERAL RESEARCH BUDGET

Consistent with the President's Management Agenda, the Administration is improving the effectiveness of the Federal Government's investments in R&D by applying transparent investment criteria in analyses that inform recommendations for program funding and management. R&D performance assessment must be done carefully to avoid negatively impacting scientific productivity. Research often leads scientists and engineers down unpredictable pathways with unpredictable results. This characteristic of research requires special consideration when measuring an R&D program's performance against its initial goals.

Elements of good R&D program management include establishing priorities with expected results, specifying criteria that programs or projects must meet to be started or continued, setting clear milestones for gauging progress, and identifying metrics for assessing results.

The R&D Investment Criteria accommodate the very wide range of R&D activities, from basic research to development and demonstration programs, by addressing three fundamental aspects of R&D:

- *Relevance*—Programs must be able to articulate why they are important, relevant, and appropriate for federal investment;
- *Quality*—Programs must justify how funds will be allocated to ensure quality; and
- *Performance*—Programs must be able to monitor and document how well the investments are performing.

R&D projects and programs relevant to industry are expected to meet criteria to determine the appropriateness of the public investment, enable comparisons of proposed and demonstrated benefits, and provide meaningful decision points for completing or transitioning the activity to the private sector.

OSTP and OMB are continuing to assess the strengths and weaknesses of R&D programs across the Federal Government in order to identify and apply good R&D management practices throughout the government.

CONCLUSION

Making choices is difficult even when budgets are generous. But tight budgets have the virtue of focusing on priorities and strengthening program management. This year's R&D budget proposal maintains levels of funding that allow America to maintain its leadership position in science and move ahead in selected priority areas. It is responsible in its treatment of security-related science and technology, and it rewards good planning and management.

America currently spends one and a half times as much on federally funded research and development as Europe does, and three times as much as Japan, the next highest investor in R&D. Our scientists collectively have the best laboratories

in the world, the most extensive infrastructure supporting research, the greatest opportunities to pursue novel lines of investigation, and the most freedom to turn their discoveries into profitable ventures if they are inclined to do so.

We lead not only in science, but also in translating science to economically significant products that enhance the quality of life for all people.

This budget will sustain this leadership and maintain science and technology capabilities that are the envy of the world. I would be pleased to respond to questions.

BIOGRAPHY FOR JOHN H. MARBURGER, III

John H. Marburger, III, Science Adviser to the President and Director of the Office of Science and Technology Policy, was born on Staten Island, N.Y., grew up in Maryland near Washington D.C. and attended Princeton University (B.A., Physics 1962) and Stanford University (Ph.D., Applied Physics 1967). Before his appointment in the Executive Office of the President, he served as Director of Brookhaven National Laboratory from 1998, and as the third President of the State University of New York at Stony Brook (1980–1994). He came to Long Island in 1980 from the University of Southern California where he had been a Professor of Physics and Electrical Engineering, serving as Physics Department Chairman and Dean of the College of Letters, Arts and Sciences in the 1970's. In the fall of 1994 he returned to the faculty at Stony Brook, teaching and doing research in optical science as a University Professor. Three years later he became President of Brookhaven Science Associates, a partnership between the university and Battelle Memorial Institute that competed for and won the contract to operate Brookhaven National Laboratory.

While at the University of Southern California, Marburger contributed to the rapidly growing field of nonlinear optics, a subject created by the invention of the laser in 1960. He developed theory for various laser phenomena and was a co-founder of the University of Southern California's Center for Laser Studies. His teaching activities included "Frontiers of Electronics," a series of educational programs on CBS television.

Marburger's presidency at Stony Brook coincided with the opening and growth of University Hospital and the development of the biological sciences as a major strength of the university. During the 1980's federally sponsored scientific research at Stony Brook grew to exceed that of any other public university in the northeastern United States.

During his presidency, Marburger served on numerous boards and committees, including chairmanship of the Governor's Commission on the Shoreham Nuclear Power facility, and chairmanship of the 80 campus "Universities Research Association" which operates Fermi National Accelerator Laboratory near Chicago. He served as a trustee of Princeton University and many other organizations. He also chaired the highly successful 1991/92 Long Island United Way campaign.

As a public spirited scientist-administrator, Marburger has served local, State and Federal governments in a variety of capacities. He is credited with bringing an open, reasoned approach to contentious issues where science intersects with the needs and concerns of society. His strong leadership of Brookhaven National Laboratory following a series of environmental and management crises is widely acknowledged to have won back the confidence and support of the community while preserving the Laboratory's record of outstanding science.

Chairman BOEHLERT. Thank you very much, Doctor.

Mr. Secretary, you are up.

STATEMENT OF DR. SAMUEL W. BODMAN, SECRETARY OF ENERGY, U.S. DEPARTMENT OF ENERGY

Secretary BODMAN. Mr. Chairman, I am very grateful, sir, to be here again before this committee and to discuss the President's 2006 budget request for science in particular at the Department of Energy.

As you are well aware, I believe very passionately in the role that science has played over the last century, really, in the economic growth of our country. And I really believe that what occurs in this budget will continue that record on into the future.

I appreciate very much what this committee has done to advance American science over the years, and I want to thank you all for

that and let you know that I am very anxious in providing leadership for the Department of Energy because of the pivotal role that the Department plays in funding science and technology throughout our country.

Scientists working for the Department's National Laboratories and in universities funded by the Department of Energy over the years have been awarded more than 80 Nobel Prizes. And to my knowledge, no one else comes anywhere close to being able to make that kind of statement.

I particularly want to recognize today, in public, the extraordinary leadership that Dr. Orbach has provided, who is our Director of the Office of Science. I think he is here today. I saw him in the room earlier. And he has done just——

Chairman BOEHLERT. You know he is here.

Secretary BODMAN. He has done quite an extraordinary job, and I wanted to recognize him. He has really brought a sense of mission and focus to that job, which is very admirable. The truth be known, I am here in his—I pulled rank on him so that I could come before this committee again.

This Department's responsibility for the future of science is best illustrated by our stewardship of the Nation's scientific infrastructure through our system of world-class National Laboratories. In addition to the Office of Science, the Department has a robust research and development portfolio extending across our programs in fossil energy, in nuclear energy, in renewable energy, in energy efficiency, environmental management, and in fact, in national security. So we cover a broad range.

The Department is the single largest supporter of research in the physical sciences. And as such, we have a special and particularly important role in this field of scientific endeavor, and it is one that I take very seriously.

The budget request, as Dr. Marburger just mentioned, for the Office of Science, is $3.5 billion, and it will maintain a very solid foundation for scientific discovery in our country. In light of the emphasis that this budget places on deficit control, this level of funding for the Office of Science signals a very strong commitment on the part of the Administration to invest in the promise of basic research for discoveries that leapfrog today's technology.

The priorities that we have set are very clear. Through the 2006 budget, we will fully support presidential initiatives in fusion and hydrogen. We will continue strong support for other Administration priorities, such as nanotechnology and information technology. We will complete on time and within budget unique scientific facilities that will maintain an enhanced research in areas that we believe offer the greatest potential for broad advances in future energy technologies. These scientific facilities were prioritized in our 20-year facilities outlook that was announced and published in November of 2003.

We will continue moving ahead with our FreedomCAR research and the President's Hydrogen Fuel Initiative to develop hydrogen-fueled vehicles and the infrastructure to support them. We are also carrying forward with U.S. participation in the International Thermonuclear Experimental Reactor, or ITER as it is known, a project that will pursue the potential of energy from nuclear fusion.

One of the biggest science stories of the year 2006 will be the start-up of the Spallation Neutron Source at our Oak Ridge National Laboratory, which will provide the most intense neutron beam in the world for cutting-edge research.

Our fiscal year 2006 will also bring four of our five nanoscale science research centers on line, providing tools found nowhere else in the world for exploration at the atomic level, offering huge potential for the discovery of entirely new ways to build materials.

We are fully funding construction of the Linac Coherent Light Source at the Stanford Linear Accelerator Center, a machine that will produce x-rays 10 billion times brighter than any existing x-ray source on earth. When it comes on line in 2009, it essentially will allow stop-action photography of atomic motion. Anyone that doubts the seriousness of this kind of accomplishment should ask someone in the pharmaceutical industry just how they could use a machine that shows the chemical bonds that are formed during the course of a chemical reaction.

The Office of Science will also fully fund the National Energy Research Scientific Computing Center, a key center for capacity supercomputing used by roughly 2,000 researchers every year, and a separate open-access leadership class computing facility focused on providing the capability to carry out a limited number of massive simulations not possible on any other civilian supercomputer in the United States.

The Department will also expand research underpinning biotechnology solutions to the world's energy challenges and research supporting the President's climate change science program.

Our research programs in high-energy physics continue to receive strong support. We have enhanced funding for future accelerators, such as the Large Hadron Collider, scheduled to begin operation in 2007, and the proposed International Linear Collider, which is now in early research and development phase. Our nuclear physics program will continue to offer world-class facilities for use by thousands of researchers around the world.

While this hearing focuses on civilian science and technology programs that are authorized by this committee, I want to note the significant contributions to science that also occur at the National Nuclear Security Administration's, or NNSA's, nuclear weapons laboratories, which are under the jurisdiction of the Armed Services Committee. Work at the weapons laboratories primarily focuses on stockpile stewardship and the Office of Science and the NNSA will work together on a number of activities.

The President's budget request for the Office of Science allows us to build on the solid foundation created over the last four years, propels us into new areas of scientific leadership, and maintains America's leadership in science, something that we are very much committed to.

And I, too, would be happy to take questions at the appropriate time.

Thank you, sir.

[The prepared statement of Secretary Bodman follows:]

PREPARED STATEMENT OF SAMUEL W. BODMAN

Chairman Boehlert, Congressman Gordon, Members of the Committee, thank you for welcoming me back, this time in my new role as Secretary of Energy. I am grateful for the opportunity to discuss the President's fiscal year 2006 budget for science at the Department of Energy.

I come before you this morning with tremendous enthusiasm for the Department's mission to maintain and enhance America's leadership in science and technology.

That responsibility is best illustrated by the Department's Office of Science stewardship of our nation's scientific infrastructure through a system of 10 world-class National Laboratories. In addition to the Office of Science, the Department has a robust research-and-development portfolio extending across our programs in fossil energy, nuclear energy, renewable energy, energy efficiency, environmental management and national security.

The Department is the single largest supporter of research in the physical sciences, and as such, we have a special and particularly important role in this field of scientific endeavor.

The budget request for the Office of Science of $3.5 billion maintains a solid foundation for scientific discovery. In light of the emphasis that this Budget places on deficit control, this level of funding for the Office of Science signals a strong commitment on the part of the Administration to invest in the promise of basic research for discoveries that leapfrog today's technology.

The priorities we have set are clear. Through the 2006 Budget, we will fully support Presidential initiatives in fusion and hydrogen, we will continue strong support for other Administration priorities such as nanotechnology and information technology, we will complete. . .on time and within budget. . .unique scientific facilities that will maintain and enhance research in areas we believe offer the greatest potential for broad advances in future energy technologies. These scientific facilities were prioritized in our 20-year facilities outlook, announced in November 2003.

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While this hearing focuses on civilian science and technology programs that are authorized by this committee, I want to note that significant contributions to science also occur at the National Nuclear Security Administration's nuclear weapons laboratories, which are under the jurisdiction of the Armed Services Committee. Work at the weapons laboratories primarily focuses on stockpile stewardship, and the Office of Science and the NNSA work together on a number of activities.

The President's budget request for the Office of Science allows us to build on the solid foundation created over the last four years, propels us into new areas of scientific leadership, and maintains America's leadership in science.

I would be happy to answer your questions.

BIOGRAPHY FOR SAMUEL W. BODMAN

Samuel Wright Bodman was sworn in as the 11th Secretary of Energy on February 1, 2005 after the United States Senate unanimously confirmed him on January 31, 2005. He leads the Department of Energy with a budget in excess of $23 billion and over 100,000 federal and contractor employees.

Previously, Secretary Bodman served as Deputy Secretary of the Treasury beginning in February 2004. He also served the Bush Administration as the Deputy Secretary of the Department of Commerce beginning in 2001. A financier and executive by trade, with three decades of experience in the private sector, Secretary Bodman was well suited manage the day-to-day operations of both of these cabinet agencies.

Born in 1938 in Chicago, he graduated in 1961 with a B.S. in chemical engineering from Cornell University. In 1965, he completed his ScD at Massachusetts Institute of Technology. For the next six years he served as an Associate Professor of Chemical Engineering at MIT and began his work in the financial sector as Technical Director of the American Research and Development Corporation, a pioneer venture capital firm. He and his colleagues provided financial and managerial support to scores of new business enterprises located throughout the United States.

From there, Secretary Bodman went to Fidelity Venture Associates, a division of the Fidelity Investments. In 1983 he was named President and Chief Operating Officer of Fidelity Investments and a Director of the Fidelity Group of Mutual Funds. In 1987, he joined Cabot Corporation, a Boston-based Fortune 300 company with global business activities in specialty chemicals and materials, where he served as Chairman, CEO, and a Director. Over the years, he has been a Director of many other publicly owned corporations.

Secretary Bodman has also been active in public service. He is a former Director of M.I.T.'s School of Engineering Practice and a former member of the M.I.T. Commission on Education. He also served as a member of the Executive and Investment Committees at M.I.T., a member of the American Academy of Arts & Sciences, and a Trustee of the Isabella Stewart Gardner Museum and the New England Aquarium.

Secretary Bodman is married to M. Diane Bodman. He has three children, two stepchildren, and eight grandchildren.

Chairman BOEHLERT. Thank you very much, Mr. Secretary.

Dr. Bement.

STATEMENT OF DR. ARDEN L. BEMENT, JR., DIRECTOR, NATIONAL SCIENCE FOUNDATION

Dr. BEMENT. Thank you, Mr. Chairman, Ranking Member Gordon, and members of the Committee. I am pleased to appear before you today to discuss NSF's fiscal year 2006 budget request. And I want to thank you, Mr. Chairman, for your unabashed support and that of your colleagues for NSF over the years. Thank you.

NSF's fiscal year 2006 budget request reflects the Administration's support for our mission. In light of the tight fiscal climate, we believe we have fared relatively well. For the coming fiscal year, NSF requests $5.6 billion, an increase of $132 million, or 2.4 percent over last year's appropriated levels. The total funding for NSF's Research and Related Activities [RRA] account in this request increases by $113 million, nearly three percent, to $4.33 billion.

Of this amount, $48 million is transferred to NSF from the Coast Guard for operation and maintenance expenses related to ice breaking in the Antarctic. We are currently working with the Coast Guard to explore options for funding icebreaker services in support of science within available NSF resources for fiscal year 2006.

Maintaining strong and robust research programs in support of individual investigators and small groups of researchers is at the core of NSF's mission. In many scientific disciplines, NSF is the major source of federal funding to academic institutions. One goal in this year's request is to strengthen our research support across all areas in our portfolio.

Research, however, is only part of the NSF equation. Our mission includes education as well. In our request, we will maintain a total investment of almost $400 million for programs with a proven track record of broadening the participation of under-represented groups in the science and engineering arena. The Louis Stokes Alliances for Minority Participation, the Centers for Research Excellence in Science and Technology, the Robert Noyce Scholarship program, the STEM Talent Expansion Program, and EPSCoR, to name just a few, are protected from reductions in this request.

Overall, the Education and Human Resources Directorate at NSF will be funded at $737 million, down 12.4 percent from last year. Although we have found it necessary to make cuts in these programs, we are also finding ways to leverage other resources in support of education. We will, for example, continue to encourage the types of partnerships between researchers and students in our RRA portfolio that provide hands-on learning experiences.

We are committed to ensuring that future generations gain the skills, knowledge, and insight that comes from working at the frontier of discovery. We will also maintain our strong working relationship with the Department of Education to implement best practices in their initiatives supporting math and science education.

While there are no new starts in our Major Research Equipment and Facilities Construction account, NSF is increasing funding in this account by $76 million for a total of $250 million to continue to fund ongoing projects.

The NSF directly supports roughly 200,000 scientists, educators, and students and processes over 40,000 proposals a year. Balancing the needs of a growing, increasingly complex portfolio with new requirements for security, e-business, accountability, and award oversight presents an ongoing challenge. In order to meet these management goals, NSF will increase funding for activities that advance organizational excellence by $46 million to a total of $336 million. This increase will allow for the recruitment of 23 additional full-time employees, enhancement and security of our e-government systems, and continuing the implementation of the business analysis recommendations that we have been working on during the past three years.

Mr. Chairman, I have touched upon the variety and richness of the NSF portfolio, but I have only scratched the surface. NSF research and education efforts contribute greatly to the Nation's innovation-driven economy and help keep America at the forefront of science and engineering. NSF-supported researchers produce leading-edge discoveries that serve society and spark the public's curiosity and interest. Extraordinary discoveries coming from dozens of NSF programs are enriching the entire science and engineering enterprise and making education fun, exciting, and achievement-oriented.

With that, I would be glad to answer any questions you may have.

[The prepared statement of Dr. Bement follows:]

PREPARED STATEMENT OF ARDEN L. BEMENT, JR.

Chairman Boehlert, Ranking Member Gordon, and Members of the Committee, thank you for this opportunity to discuss NSF's FY 2006 budget Request. It is a pleasure to appear before you today. For over fifty years, NSF has been charged with being a strong steward of the scientific discovery and innovation that has been crucial to increasing America's economic strength, global competitiveness, national security, and overall quality of life.

For many years, the United States economy has depended heavily on investments in research and development—and with good reason. America's sustained economic prosperity is based on technological innovation made possible, in large part, by fundamental science and engineering research. Innovation and technology are the engines of the American economy, and advances in science and engineering provide the fuel.

Investments in science and technology—both public and private—have driven economic growth and improved the quality of life in America for the last 200 years. They have generated new knowledge and new industries, created new jobs, ensured economic and national security, reduced pollution and increased energy efficiency, provided better and safer transportation, improved medical care, and increased living standards for the American people. Innovation and technology have become the engines of the American economy, and advances in science and engineering provide the fuel.

Investments in research and development are among the highest-payback investments a nation can make. Over the past 50 years technological innovation has been responsible for as much as half of the Nation's growth in productivity.

Sustaining this innovation requires an understanding of the factors that contribute to it. The Council on Competitiveness, a consortium of industry, university, and labor leaders, has developed quantitative measures of national competitiveness: the number of R&D personnel in the available workforce; total R&D investment; the percentage of R&D funded by private industry; the percentage of R&D performed by the university sector; spending on higher education; the strength of intellectual property protection, openness to international competition; and per capita gross domestic product. A similar set of indicators has been developed by the World Bank Group, and voluminous data have been compiled by NSF. The important point underscored by these indicators is that, for America to remain a prosperous and secure country, it must maintain its technological leadership in the world.

Perhaps the Council on Competitiveness' 2004 *National Innovation Initiative* report captured it best by simply stating, "Innovation has always been the way people solved the great challenges facing society."

Often times, the connection between an area of research, or even a particular scientific discovery, and an innovation may be far from obvious. Fundamental research in physics, mathematics and high-flux magnets supported by NSF led to the development of today's Magnetic Resonance Imaging (MRI) technology. Today, MRIs are used widely to detect cancer and internal tissue damage. Fundamental research on extremophiles, or microorganisms living in extreme environments, led to the polymerase chain reaction, a procedure paramount to modern biotechnology, as well as one that allows us to use DNA for forensic evidence. Continuing progress in basic science and engineering research promises more discoveries as well as further improvements in living standards and economic performance.

And still, science and engineering is becoming an ever-larger portion of our nation's productivity. In the early 1950s, Jacob Bronowski wrote, "The world today is powered by science." I would take this premise one step farther, "No science; no economic growth." Our current level of scientific and technological productivity is what keeps us ahead of our global competitors as the playing field continues to become more level.

NSF has helped advance America's basic science and engineering enterprise for over fifty years. Despite its small size, NSF has an extraordinary impact on scientific and engineering knowledge and capacity. While NSF represents only four percent of the total federal budget for research and development, it accounts for 50 percent of non-life science basic research at academic institutions. In fact, NSF is the *only* federal agency that supports *all* fields of science and engineering research and the educational programs that sustain them across generations. NSF's pro-

grams reach over 2,000 institutions across the Nation, and they involve roughly 200,000 researchers, teachers, and students.

NSF specifically targets its investments in fundamental research at the frontiers of science and engineering. Here, advances push the boundaries of innovation, progress and productivity.

Compared to other commodities, knowledge generated from basic science investments is unique, long lasting and leverages on itself. Knowledge can be shared, stored and distributed easily, and it does not diminish by use. Incremental advances in knowledge are synergistic over time. NSF is proud to have built the foundation for this knowledge base through decades of peer-reviewed, merit-based research.

FY 2006 Budget Request

The Foundation's FY 2006 budget Request reflects the Administration's confidence in our continuing with this mission. In light of the tight fiscal climate, NSF fared relatively well. For the coming fiscal year, NSF requests $5.6 billion, an increase of $132 million, or 2.4 percent, over last year's appropriated levels.

At a time when many agencies are looking at budget cuts, an increase in our budget underscores the Administration's support of NSF's science and engineering programs, and reflects the agency's excellent management and program results.

With the wealth of benefits that investments in science and engineering bring to the Nation, perhaps none is more powerful than the capability to respond quickly and effectively to challenges of all kinds. NSF's programs reach over 2,000 institutions across the Nation, and they involve researchers, teachers, and students in all fields of science and engineering and at all levels of education. They also keep us abreast of scientific advances throughout the world. This breadth of activity in and of itself creates a vital national resource, as it provides the Nation with a constantly invigorated base of knowledge, talent, and technology. For example, in areas ranging from terrorism threats to natural disasters, NSF's ongoing support of research in areas such as advanced information technologies, sensors, and earthquake engineering ensures a broad base of expertise and equipment that allows the science and engineering community to respond quickly in times of need and in partnership with scientists and engineers from other countries.

Four funding priorities centering this year's request are designed to address current national challenges and strengthen NSF's core research investments. They include: (1) Strengthening core disciplinary research; (2) Providing broadly accessible cyberinfrastructure and world-class research facilities; (3) Broadening participation in the science and engineering workforce; and (4) Sustaining organizational excellence in NSF management practices.

This year's investments will strengthen the core disciplines that empower every step of the process from discovery at the frontier to the development of products, processes, and technologies that fuel the economy. At the same time, NSF's investments will enable increasing connections and cross-fertilization among disciplines.

NSF's focus on a clear set of priorities will help the Nation meet new challenges and take advantage of promising opportunities, while at the same time spurring the growth and prosperity needed to secure the Nation's long-term fiscal balance. The FY 2006 budget will emphasize investments that address established interagency research priorities, meet critical needs identified by the science and engineering community, and advance the fundamental knowledge that strengthens the Nation's base of innovation and progress. NSF will respond to these challenges by supporting the best people, ideas, and tools in the science and engineering enterprise, and by employing the best practices in organizational excellence.

Research and Related Activities Account

For FY 2006, total funding for NSF's Research and Related Activities account increases by $113 million—nearly three percent—to $4.33 billion. This increase largely reflects NSF efforts to strengthen fundamental research in the core scientific disciplines as well as promote emerging areas of research. The FY 2006 portfolio balances research in established disciplines with research in emerging areas of opportunity and cross-disciplinary projects. The most fertile opportunities sometimes lie in novel approaches or a collaborative mix of disciplines.

Maintaining a strong and robust core is critical during such a budget climate as certain segments of the academic community rely heavily on NSF funding. In many scientific disciplines, NSF is a major source of federal funding to academic institutions, including mathematics (77 percent), computer sciences (86 percent), the social sciences (49 percent), the environmental sciences (50 percent), engineering (45 percent) and the physical sciences (39 percent).

Research, however, is only part of the NSF equation. Training the Nation's next generation of scientists and engineers is another key component of NSF's mission,

and critical for maintaining economic prosperity and global competitiveness. Here, we are finding ways to leverage our resources. For example, as we strengthen our core disciplinary research programs, we will continue to encourage the types of partnerships between researchers and students that provide hands-on experience while ensuring that future generations gain the skills, knowledge and insight that come from working at the frontier of discovery.

Providing Broadly Accessible Cyberinfrastructure and World-Class Research Facilities

Twenty-first century researchers and the students who will bring new skills into the workforce rely on cutting edge tools. In FY 2006, NSF is placing a high priority on investments in cyberinfrastructure and in unique, widely shared research equipment and facilities.

An infrastructure of power grids, telephone systems, roads, bridges and rail lines buttressed this nation's industrial economy and allowed it to prosper. However, cyberinfrastructure—a networked system of distributed computer information and communication technology—is the lynchpin of today's knowledge based economy. In FY 2006, NSF cyberinfrastructure investments total $509 million, an increase of $36 million (7.6 percent) over the FY 2005 level.

Modeling, simulation, visualization, data storage and communication are rapidly transforming all areas of research and education. NSF investments in cyberinfrastructure support a wide mix of projects and encourage participation from broad segments of the research community that rely on such technology as they tackle increasingly complex scientific questions. Thanks to cyberinfrastructure and information systems, today's scientific tool kit includes distributed systems of hardware, software, databases and expertise that can be accessed in person or remotely. In fact, programs such as Teragrid, a multi-year effort to create the world's largest distributed infrastructure for open scientific research, are specifically designed to transcend geographic boundaries and accelerate virtual collaborations.

NSF is also increasing funding for the Major Research Equipment and Facilities Construction by $76 million or 44 percent, in FY 2006 for a total of $250 million. There are no new starts, but we will continue to fund ongoing projects. Work will proceed on five major facilities that will serve a spectrum of the science and engineering community. These include world-class astronomy, physics, and geosciences observatories identified as the highest priorities for advancing science and engineering.

- The Atacama Large Millimeter Array (ALMA), in Chile, is a model of international collaboration. It will be the world's largest, most sensitive radio telescope.
- The EarthScope facility is a multi-purpose array of instruments and observatories that will greatly expand the observational capabilities of the Earth Sciences and permit us to advance our understanding of the structure, evolution and dynamics of the North American continent.
- Ice Cube, the world's first high-energy neutrino observatory will be located under the ice at the South Pole.
- RSVP, the Rare Symmetry Violating Processes Project will enable cutting edge physics experiments to study fundamental properties of nature. Studies will probe questions ranging from the origins of our physical world to the nature of dark matter.
- SODV, the Scientific Ocean Drilling Vessel, is a state-of-the-art ship that will be a cornerstone of a new international scientific ocean drilling program. Ocean core sediment and rock collected by the vessel will help investigators explore the planet's geological history and probe changes in the earth's oceans and climate.

Additionally, In FY 2006, NSF will assume the responsibility, from the U.S. Coast Guard, for funding the costs of icebreakers that support scientific research in polar regions; $48 million was transferred for those purposes.

Broadening Participation

To feed our knowledge-based economy, the Nation needs to capitalize on all of its available talent to produce a workforce of skilled technologists, scientists and engineers. That means developing the largely untapped potential of those under-represented in the science and engineering workforce—minorities, women and persons with disabilities. It also means supporting science education and training in all regions of the country—not just at large Universities or in a handful of states.

To achieve these goals, the FY 2006 Request maintains a total investment of almost $400 million. Funding will be targeted to programs with a proven track record of progress in these areas. Included in this is $8 million in additional support from the research directorates that will supplement the Education and Human Resources Account to help achieve our goal of broadening science and engineering participation. Working closely with the directorates offers a dual benefit of providing educational opportunities and hands-on research experience to prepare students for the 21st century workforce.

NSF will invest $396.5 million in a range of programs with proven track records. Several highly successful programs for broadening participation—the Louis Stokes Alliances for Minority Participation, the Alliances for Graduate Education and the Professoriate, the Centers for Research Excellence in Science and Technology (CREST), Robert Noyce Scholarship program, STEM Talent Expansion Program and EPSCoR—just to name a few, are secured in this request. Each of these serve as models for integrating educational and research resources to improve recruitment and retention in science and engineering to all sectors of our diverse population.

Sustaining Organizational Excellence in NSF Management Practices

NSF directly supports over 210,000 scientists, educators and students and processes over 40,000 proposals a year. Balancing the needs of a growing, increasingly complex portfolio with new requirements for e-business practices, security, accountability, and award oversight presents a challenge. NSF sets high standards for its business practices and strives to create an agile, innovative organization through state-of-the-art business conduct and continual review. In order to meet these management goals, NSF will be increasing funding for activities that advance organizational excellence by $46 million, to a total of $336 million. In addition to critically needed upgrades to our information technology infrastructure, this increase will allow for the recruitment of 25 full-time employees—23 for NSF and one each for the National Science Board and the Office of the Inspector General—which will improve our ability to manage our increasingly complex portfolio.

Expanding our e-government systems and the implementing of our ongoing business analysis recommendations are high priorities for FY 2006.

Over the past two years, as part of the Administrations Program Assessment Rating Tool, NSF has worked with OMB to rate eight of our investment categories. All of these areas have received the highest rating of Effective. As such, NSF programs fall within the top 15 percent of 600 government programs evaluated to date.

Crosscutting Activities

Beyond our budget priorities lie dozens of programs and initiatives that cut across NSF directorates and enrich the overall science and research enterprise. NSF sets priorities based on a continual dialogue and exchange of ideas with the research community, NSF management and staff and the National Science Board. Programs are initiated based on several criteria: intellectual merit, broader impacts of the research, balance across disciplines and synergy with research in other agencies. The Committee of Visitors process ensures a continuous evaluation of our merit review process and feedback on how NSF programs are performing. In FY 2006, NSF will emphasize four crosscutting areas.

Crosscutting areas of emerging opportunity: Over several years, NSF has funded exceptionally promising interdisciplinary efforts aimed at advancing our knowledge, addressing national needs, and probing the grand challenges of science. The FY 2006 request maintains or increases FY 2005 levels of funding for the following priority areas: $84 million for Biocomplexity in the Environment, $243 million for Nanoscale Science and Engineering, $89 million for the Mathematical Sciences Priority Area and $39 million for Human and Social Dynamics.

International Collaborations: Science and engineering research are increasingly global endeavors. International partnerships are critical to the United States in maintaining a competitive edge, capitalizing on global opportunities, and addressing global problems. The Office of International Science and Engineering's recent move to the director's office, and the budget request reflects this important trend. The FY 2006 budget provides $35 million for NSF's Office of International Science and Engineering.

The recent Indian Ocean Tsunami disaster represents the finest in international cooperation—and clearly demonstrates an international desire to develop scientific methods for natural disaster prediction and ways to reduce losses when such catastrophic events do inevitably occur. A network of more than 128 sensors—which NSF has a 20-year investment in—recorded shock waves from the recent earthquake as they traveled around the earth. This network is the primary international source of data for earthquake location and tsunami warning and its data forged the

critical core of the early knowledge of this event. Within days of the disaster NSF research teams deployed to the region to gather critical data before it was lost to nature and reconstruction. Their work will help scientists and engineers better understand the warning signs of natural disasters, the design of safer coastal structures, the development of early warning and response systems, and effective steps for disaster recovery.

Interagency Initiatives: NSF will continue to play a lead role in interagency collaborations to address national needs and take advantage of economic growth opportunities. In FY 2006, NSF investments in the National Nanotechnology Initiative increase by $6 million over FY 2005 levels to total $344 million. NSF participation in the Networking Information Technology Research and Development initiative will increase to $803 million—$8 million over the FY 2005 level. The NSF contribution to the Climate Change Science Program decreases slightly to $197 million.

Homeland Security Activities: The FY 2006 Request includes a $2 million increase for government-wide efforts in homeland security research and development. This $344 million investment will strengthen NSF's commitment to cyber security by supporting innovations to secure today's computer and networking systems, embed cyber security into future systems and preparing tomorrow's workforce with state-of-the-art security skills.

Conclusion

Mr. Chairman, I've only touched upon the variety and richness of the NSF portfolio. NSF research and education efforts contribute greatly to the Nation's innovation economy and help keep America at the forefront of science and engineering. At the same time, NSF supported researchers produce leading edge discoveries that serve society and spark the public's curiosity and interest. Extraordinary discoveries coming from dozens of NSF programs and initiatives are enriching the entire science and engineering enterprise, and making education fun, exciting and achievement-oriented. In fact, just this month, two of the most widely-read and e-mailed stories from the national press were the discoveries of NSF-supported researchers.

In one, scientists using new bio-bar-code technology created a detection method for a protein implicated in Alzheimer's disease. It's the first test designed for use in living patients and holds promise for diagnosing Alzheimer's at an early stage. In the second development, scientists generated an entirely new classification system for the brains of birds based on recent studies showing that birds are much closer in cognitive ability to mammals than previously thought. The new scheme will affect thousands of scientists, and help merge research efforts on both birds and mammal. These two examples, fresh off the press, illustrate NSF's motto "Where Discoveries Begin."

Mr. Chairman and Members of the Committee, I hope that this brief overview conveys to you the extent of NSF's commitment to advancing science and technology in the national interest. I am very aware and appreciative of the Committee's longstanding bipartisan support for NSF. I look forward to working with you in months ahead, and would be happy to respond to any questions that you have.

BIOGRAPHY FOR ARDEN L. BEMENT, JR.

Arden L. Bement, Jr., became Director of the National Science Foundation on November 24, 2004. He had been Acting Director since February 22, 2004.

He joined NSF from the National Institute of Standards and Technology, where he had been director since Dec. 7, 2001. Prior to his appointment as NIST director, Bement served as the David A. Ross Distinguished Professor of Nuclear Engineering and head of the School of Nuclear Engineering at Purdue University. He has held appointments at Purdue University in the schools of Nuclear Engineering, Materials Engineering, and Electrical and Computer Engineering, as well as a courtesy appointment in the Krannert School of Management. He was director of the Midwest Superconductivity Consortium and the Consortium for the Intelligent Management of the Electrical Power Grid.

Bement served as a member of the U.S. National Science Board from 1989 to 1995. The board guides NSF activities and also serves as a policy advisory body to the President and Congress. As NSF director, Bement will now serve as an ex officio member of the NSB.

He also chaired the Commission for Engineering and Technical Studies and the National Materials Advisory Board of the National Research Council; was a member of the Space Station Utilization Advisory Subcommittee and the Commercialization and Technology Advisory Committee for NASA; and consulted for the Department of Energy's Argonne National Laboratory and the Idaho National Engineering and Environmental Laboratory.

Bement joined the Purdue faculty in 1992 after a 39-year career in industry, government, and academia. These positions included: Vice President of Technical Resources and of Science and Technology for TRW Inc. (1980–1992); Deputy Under Secretary of Defense for Research and Engineering (1979–1980); Director, Office of Materials Science, DARPA (1976–1979); Professor of Nuclear Materials, MIT (1970–1976); Manager, Fuels and Materials Department and the Metallurgy Research Department, Battelle Northwest Laboratories (1965–1970); and Senior Research Associate, General Electric Co. (1954–1965).

He has been a Director of Keithley Instruments Inc. and the Lord Corp. and was a member of the Science and Technology Advisory Committee for the Howmet Corp. (a division of ALCOA).

Bement holds an engineer of metallurgy degree from the Colorado School of Mines, a Master's degree in metallurgical engineering from the University of Idaho, a doctorate degree in metallurgical engineering from the University of Michigan, an honorary doctorate degree in engineering from Cleveland State University, and an honorary doctorate degree in science from Case Western Reserve University. He is a member of the U.S. National Academy of Engineering.

Chairman BOEHLERT. Thank you very much, Doctor.

Mr. Kassinger.

STATEMENT OF MR. THEODORE W. KASSINGER, DEPUTY SECRETARY OF COMMERCE

Mr. KASSINGER. Mr. Chairman, Mr. Gordon, members of the Committee, thank you for inviting me to testify today on the President's fiscal year 2006 budget request for research and development at the Department of Commerce.

This Committee is a constant and strong voice for the science and technology community. We look forward to continuing to work with you to ensure that America remains the world leader in science and technology.

The Commerce Department has many diverse responsibilities, but collectively our programs constitute one of the Nation's great science enterprises. The President's budget request for fiscal year 2006 reflects his strong commitment to the Department's science and technology programs.

Those programs continue to demonstrate remarkable creativity. For example, NIST scientists recently created a new form of matter, called a fermionic condensate, that could help unlock the mysteries of superconductivity, a phenomenon with the potential to improve energy efficiency. Other scientists developed a series of clinical standards that will help make diagnosing heart attacks more precise and demonstrated a low-power, extremely sensitive magnetic sensor about the size of a grain of rice.

NOAA also remains at the forefront of science in the public interest. NOAA aircraft covered more than 100,000 nautical miles of track lines and deployed over 1,200 drops into storms during the busy 2004 hurricane season. NOAA commissioned the U.S. Climate Reference Network, which now contains 72 stations across the country, to reduce uncertainty of long-term temperature and precipitation trends. In this past summer, NOAA led hundreds of government and university scientists from across the country and western Europe in the largest air quality and climate study to date.

The world-class caliber of the Commerce Department scientists and engineers was recognized this past year through numerous prestigious publications and awards. For just two examples, Susan Solomon, a NOAA atmospheric scientist, was awarded the 2004 Blue Planet Prize for her pioneering work in identifying the mecha-

nism that produces the Antarctic ozone hole and contributions towards the protection of the ozone layer. NIST researcher, Deborah Gin, was selected as both the Research Leader of the Year by Scientific American Magazine and is the winner of the Service to America Medal for Science and Environment, a prestigious national award recognizing excellence among America's federal public servants.

The Department's fiscal year 2006 budget request supports these researchers and other—and ongoing initiatives while seeking further to provide the Nation with a strong foundation for a healthy economy, enhanced competitiveness, and an improved quality of life for all Americans.

Mr. Chairman, with that overview, let me summarize the highlights of the proposed budget requests, beginning with the Technology Administration.

For fiscal year 2006, the Administration requests $536 million for TA, including $4.2 million for the Office of the Under Secretary and $532 million for NIST. Of the NIST request, $420.6 million is for laboratory programs, a 12.6 percent increase over the fiscal year 2005 appropriation. These programs provide U.S. industry in the science and technology community with the measurement capabilities, standards, evaluated reference data, and test methods needed to support innovation and to improve quality in virtually all technology-intensive sectors.

Among other things, the fiscal year 2006 request proposes an additional $40 million in funding for three areas that target pressing national priorities. These include increases in advances in manufacturing with components addressing nanomanufacturing, measurements and standards for homeland security, and new measurement horizons for the U.S. economy and science.

Turning to NOAA, for fiscal year 2006, the Administration request $3.6 billion. These funds will allow NOAA to advance our understanding of our marine and atmospheric resources, and in so doing, will help sustain this country's economic vitality and environmental health. NOAA is leading efforts to better understand the complex interactions on our planet through the development of the Global Earth Observation System of Systems, GEOSS. Our fiscal year 2006 budget request includes increases of approximately $95 million to support the requirements of GEOSS.

Included in this effort is $10 million to expand the U.S. Tsunami Warning Network. NOAA will deploy 32 new advanced technology buoys as part of a fully-operational tsunami warning system by mid-2007. The new system will provide the United States with nearly 100 percent detection capability for a U.S. coastal tsunami, allowing notification to local managers within minutes. The new system will also expand monitoring capabilities throughout the entire Pacific and Caribbean basins, providing tsunami warning for regions bordering half of the world's oceans.

To implement the President's U.S. Ocean Action Plan, the Administration's request includes significant resources for NOAA's ocean and coastal programs as well as fisheries and protected species activities. We request more than $1 billion for these ongoing programs, including approximately $60 million to address state and regional ecosystem research priorities at the National Sea Grant

College Program, $23 million in support of the NOAA Ocean Exploration Program, $33 million for building a new fisheries research vessel, and $25 million for fishery stock assessment.

Mr. Chairman, that completes my statement. Thank you, once again, for your continued support. And of course, I would be pleased to take any questions.

[The prepared statement of Mr. Kassinger follows:]

PREPARED STATEMENT OF THEODORE W. KASSINGER

Mr. Chairman and Members of the Committee, I am pleased to join you today as we examine the Administration's budget request for research and development at the Department of Commerce and the Department's role in reinforcing America's technological leadership. I want to thank the Committee, especially Chairman Boehlert, for your continued support and leadership on innovation issues, as well as your support for NOAA's part in the Administration's tsunami initiative. You have been a constant and strong voice for the science and technology community. I look forward to continuing our work together with you and the other Members of the Committee to ensure that America remains the world leader in the science and technology field.

INTRODUCTION

The Department of Commerce works to create the conditions for economic growth and opportunity for all Americans by promoting innovation, entrepreneurship, competitiveness, and stewardship. We provide tools to help maximize U.S. competitiveness and enable economic growth for American industries, workers, and consumers. Of particular importance to this committee is the work that Commerce does in fostering America's science and technological leadership by conducting basic research and experimentation, enhancing technical standards, advancing measurement science, and promoting environmental stewardship.

Maintaining America's technological leadership is important not just for our nation's national security, but also to ensure continued U.S. economic growth. Science and technology are the pistons that help propel the American engine of prosperity. This Administration's commitment to science and technology continues to foster the conditions for both economic growth and employment opportunity. These investments in science and technology provide the catalyst that enables private enterprises to provide our nation and our people with good jobs, a better quality of life, and inventions that have established our national identity.

The President understands the opportunity science and technology provide to enhance the lives of all Americans. The President's focus in the area of science and technology is reflected in the Department of Commerce R&D portfolio. The Commerce budget maintains substantial R&D investments in two of our bureaus, the Technology Administration (TA) (which includes the National Institute of Standards and Technology (NIST) and the National Technical Information Service) and the National Oceanic and Atmospheric Administration (NOAA). The overall FY 2006 budget request for TA is $536.2 million, a small increase over our FY 2005 request. However, the request represents an increase of over $47 million from the FY 2005 enacted amount for NIST's core laboratory programs, the NIST programs most effective and necessary in supporting the fundamental scientific understanding and technological needs of U.S.-based businesses, American workers, and the domestic economy. For FY 2006, we will be seeking program increases of $19.6 million for advanced manufacturing research, $3.0 million for measurements and standards work related to homeland security, $17.2 million for measurement infrastructure improvements, and $35.4 million for high priority facilities modernization and maintenance needs. For NOAA, we are requesting $3.6 billion, an increase of $205 million from our FY 2005 request. Of the increase, $94.7 million will support requirements to build an integrated Earth observing system.

While the focus of this testimony is on TA/NIST and NOAA, I should also note that the United States Patent and Trademark Office (USPTO) and the National Telecommunications and Information Administration (NTIA) play significant roles in promoting the Department of Commerce's technology goals. USPTO ensures that the intellectual property system contributes to a strong global economy, encourages investment in innovation, and fosters entrepreneurial spirit. NTIA works to spur innovation by promoting efficient use of federal radio spectrum and encouraging the development and implementation of new and emerging telecommunications technologies, helping consumers and creating jobs.

The Technology Administration and its various components seek to maximize technology's contribution to economic growth, high-wage job creation, and the social well-being of the United States. TA and NIST not only serve as advocates for technological innovation but also analyze the factors that affect our competitiveness and develop the tools needed to enhance productivity, trade, and, in the end, the quality of life for all Americans. In addition, NIST is engaged in critical research in high-priority areas of technological innovation such as nanotechnology, information technology, biotechnology, and manufacturing technology. NIST is also conducting research in response to the World Trade Center tragedy and the February 2003 nightclub fire in Rhode Island to better prepare facility owners, contractors, architects, engineers, emergency responders, and regulatory authorities to respond to future disasters.

The National Oceanic and Atmospheric Administration's mission is to understand and predict changes in the Earth's environment, as well as to conserve and manage coastal and marine resources to meet our nation's economic, social, and environmental needs. The work performed at NOAA touches the daily lives of every person in the United States and in much of the world. The agency

- provides weather, water, and climate services;
- manages and protects marine resources ecosystems;
- conducts atmospheric, climate, and ecosystems research;
- promotes efficient and environmentally safe commerce and transportation; and
- provides emergency response and vital information in support of homeland security.

In addition to using science and technology to create jobs and improve economic prosperity, the Department is also directing resources toward disaster prevention, to better understand and minimize the loss of life and property from disasters.

In January 2005, the Administration announced that the U.S. tsunami detection and warning capabilities would be expanded as a contribution to the Global Earth Observation System of Systems (GEOSS). NOAA's advanced technology will create an expanded tsunami warning system that is expected to be fully operational by 2007. These programs will help NOAA improve public safety and economic security in the United States and throughout the world.

Currently, NOAA leads the Nation and world in ocean and ecosystem science, policy and management. In December 2004, the Administration released the "U.S. Ocean Action Plan," a response to the U.S. Commission on Ocean Policy's report entitled, "An Ocean Blueprint for the 21st Century." Working under the leadership of the Council on Environmental Quality, and with several other agencies, NOAA substantially assisted in the development of this action plan. NOAA will play a key role in implementing many of the ocean policy measures that it contains, including supporting the establishment of a coordinated ocean governance structure. Consistent with this approach, the Administration continues to support Commerce's leadership role in oceans policy and activities by promoting passage of a NOAA Organic Act. We look forward to discussing this with you further when you consider this legislation.

NOAA's global leadership also extends to monitoring the planet through the development of the GEOSS. The GEOSS will provide NOAA and others with the tools to better understand our planet through an integrated, comprehensive, and sustained Earth observation program.

NOAA leads the Administration's interagency Climate Change Science Program. As needs for water, climate, and air quality information increase worldwide, NOAA has been working to improve our understanding of climate and helping develop products and services that provide useful information for national and regional management decisions. One example of this is the National Integrated Drought Information System (NIDIS), which provides early drought warning on a regional level.

HIGHLIGHTS OF THE FY 2006 BUDGET REQUEST

Technology Administration Programs

The mission of the Technology Administration (TA), which includes the Under Secretary of Commerce for Technology and two major components, the National Institute of Standards and Technology (NIST) and the National Technical Information Service (NTIS), is to maximize technology's contribution to America's economic growth. In addition, the agency seeks to encourage the development of the technological infrastructure required to support U.S. industry through the 21st Century; to foster the development, diffusion, and adoption of new technologies; and to create a business environment conducive to innovation.

The Department requests $4.2 million for the Office of the Under Secretary for Technology (TA/US). The Administration proposes to streamline the administrative and policy operations of the Technology Administration's Office of the Under Secretary. The Office of the Under Secretary, in its technology policy leadership role, will continue to provide policy guidance to the Secretary of Commerce and the Technology Administration's component agencies, serve as an interagency leader on key Administration technology initiatives, lead the National Medal of Technology Program, participate in the President's National Science and Technology Council's Committee on Technology, promote Administration policies for innovation and industrial competitiveness within and outside government, and provide leadership within the Department as chair of the Commerce Coordinating Council for Technology. The Under Secretary's office will continue to coordinate the civilian science and technology efforts of federal agencies and help to shape federal civilian R&D priorities after considering the views of industry. The Under Secretary will continue to provide counsel to the Secretary of Commerce on all matters affecting innovation, and coordinate with counterpart offices in the trade and economic agencies to create unified, integrated trade and technology policies.

National Institute of Standards and Technology

NIST's proposed $532 million budget request for FY 2006 focuses the Institute's resources on addressing the critical national priorities that can best be served by the Institute's unique cross-disciplinary expertise in science and technology. As noted above, the request includes a $47 million increase for NIST's core laboratory programs. The NIST budget request for FY 2006 also reflects the President's concern for focusing intently on other national priorities. While the request covers strategic investments in Institute capabilities, it still helps meet the President's overall budget goals by reducing NIST's budget more than $163 million compared with FY 2005 appropriations, accomplished by shifting resources from lower-priority programs.

Advances in Manufacturing ($19.6 million increase)

The Department is requesting a $19.6 milllion increase for NIST in Advanced Manufacturing research. The growth of the global economy—the rapid exchange of goods and technologies—has placed unprecedented pressures on the Nation's manufacturing sector. Most observers agree that if the United States is to compete successfully, it must be on the basis of sustained, superior innovation in all aspects of manufacturing. We must lead the pack. Innovation must go further than new products and processes, however. The United States must innovate in the business of manufacturing, improving efficiencies and continuing the productivity increases that have sustained the manufacturing sector since the Second World War.

- *National Nanomanufacturing and Nanometrology Facility (N^3F) ($10 million).* The largest major element of NIST's advanced manufacturing initiative is the development of a national "user facility" for nanotechnology research in the AML. The N^3F will give qualified collaborators from industry and government access to the state-of-the-art laboratories of the AML, the existing nanotechnology expertise of the seven NIST laboratories, and mechanisms for partnering on nanotech projects. Together with public and private sector partners, NIST will use the N^3F to investigate the fundamental physics, mechanisms and metrology to manipulate matter atom-by-atom, in order to build perfectly defined nanostructures with predefined electronic, mechanical, and quantum properties. N^3F will offer U.S. industry in a single institution an unmatched measurement infrastructure to compete at the nanoscale.
- *Nanomanufacturing research ($4 million).* As manufacturing processes and products become ever more sophisticated, the key battlefields of 21st-century manufacturing will depend more and more on excellence in measurement technology. This is true across the board in manufacturing, but nowhere more so than in the rapidly developing field of nanomanufacturing, where it can be necessary to locate, track and manipulate individual molecules and atoms. NIST's nanomanufacturing research effort will concentrate on delivering the critical measurement technology and standards infrastructure across the broad spectrum of science and engineering that is "nanotechnology," including nanodevices (mechanical and electronic), nanomagnetics, nanomanipulation, and nanoscale materials characterization. NIST is uniquely positioned for this work not only because of its long history of expertise in measurement research, but also because of the recent completion of its Advanced Measurement Laboratory (AML), which offers a unique collection of state-of-the-art precision measurement labs.

- *Manufacturing enterprise integration ($1.6 million).* America's large manufacturers are globally distributed enterprises. They rely on a system of small manufacturers, part suppliers, shippers, and raw materials producers organized in extended enterprises called supply chains. Successfully managing production throughout the supply chain is critical to the competitiveness of these extended enterprises. Production costs are no longer the major cost drivers in these global supply chains—the dominant factor is the cost of engineering and business activities. But many small manufacturers not equipped to do business in these sophisticated, distributed enterprises are being left out and are in danger of failure. One independent economic study commissioned by NIST shows that the automotive supply chain alone loses $1 billion annually due to inefficient engineering and business data exchanges. NIST proposes a wide-ranging program to work with U.S. manufacturers to create a "roadmap" for the development of open standards for enterprise integration, to develop and test standards and standard conformance tests, and to ensure that they are integrated and consistent with developing international standards.
- *Expanding access to global markets through measurements and standards ($4 million).* Even with superior technology, American manufacturers can be effectively locked out of profitable foreign markets through artificial barriers of local standards and regulations. Knocking down these barriers—or preventing them from being raised in the first place—is an issue of international standards, harmonization, and measurement compatibility, again, part of NIST's core expertise. Eighty percent of global merchandise trade is influenced by testing and other measurement-related requirements of regulations and standards. U.S. manufacturers need standards and calibrations to be aligned with international standards to give them seamless access to foreign markets. In addition, NIST monitors foreign and international standards efforts for potential impact on U.S. exports. NIST will develop leading-edge measurement capabilities for key technologies and new, more efficient ways to deliver the highly accurate measurements needed by U.S. industry to create and market products based upon new technologies. NIST will continue its efforts to support access to foreign markets through technical leadership and coordination of key trade-related documentary standards activities in specific technology sectors.

Measurements and Standards for Homeland Security ($3 million increase)

Measurements and standards are increasingly understood to be an important component of homeland security, whether in helping to mitigate the effects of disasters, both natural and man-made, or in helping to ensure the reliability of the new high-tech tools being brought to bear in the war on terrorism. NIST will continue to coordinate its work closely with the Department of Homeland Security and other agencies.

- *Improved standards and guidelines for first responders and buildings ($1 million).* NIST has long been recognized for its contributions to public safety in building technology—the development of test methods and engineering data to make buildings safer and more resistant to earthquakes and fire, for example—but the increased risk of terrorist attacks since September 11, 2001, has added to natural disasters a new dimension of deadly, human-engineered threats. A private-sector coalition representing the key industry, standards, codes and professional organizations has worked with NIST to establish a comprehensive program to identify and address high priority national needs for building safety. Key areas include increased structural integrity, standards for first-responder equipment, enhanced fire resistance of structures, building operations in emergencies, and improved emergency egress and access. NIST will expand support for this effort, developing the technical basis for needed improvements in practice, standards, and codes for buildings and for guidelines and equipment standards for first responders. The Institute will develop simulation and decision-support tools and technical guidelines, conduct trial designs to demonstrate the effectiveness of technical solutions, and recommend specific proposals for needed changes to codes and standards.
- *Biometrics ($1 million).* Biometrics—positive identification of individuals based on physical characteristics—is a critical tool in the war on terrorism. As terrorist and criminal databases become larger and larger, it is more and more important that biometric technologies perform accurately and quickly. As this dynamic technology continues to evolve, the field must be constantly reassessed to ensure that the government is using the most accurate biomet-

ric recognition technology available for a given application. NIST will build on its existing expertise in biometrics to certify facial recognition technologies to make certain that all requirements for border security are met, build on its testing program for determining the accuracy of new multi-modal biometric systems (those combining two or more biometric techniques), and develop tests and guidelines to ensure that future biometric systems are inter-operable and work efficiently in real-world applications.

New Measurement Horizons for the U.S. Economy and Science ($17.2 million increase)

One of the most serious challenges NIST faces in its mission to provide the measurement infrastructure needed by the Nation's scientific and industrial communities is the requirement for the relatively small Institute to stay not only abreast of but—in many cases—ahead of rapidly changing developments across the broad range of science and technology.

- *Biosystems and health ($7,195,000).* The advances in biology and biotechnology in the last few years—both new understanding in fields like genomics and proteomics and new capabilities and technologies such as gene engineering and microarrays—constitute a technological revolution in fields as diverse as material science, agriculture and health care. A lack of measurement tools for ensuring accuracy and reliability looms as a major roadblock that could prevent promising biotechnologies from achieving their potential for mainstream health care applications.

  NIST has a unique, multidisciplinary expertise in measurement science that is essential in a field like biotechnology, which lies at the interface of biology, chemistry, physics and mathematics. The Institute also has a long history of working with the health care industry to provide needed measurement technologies and reference standards ranging from clinical standards for cholesterol and glucose to DNA. Under this initiative, NIST will establish a systems approach to identifying and removing measurement-related barriers to the effective application of biotechnology in health care. The Institute also will further the development of bioinformatics—the computational and information science tools needed to assemble, organize, summarize and analyze the mountains of biological data produced by these new technologies.
- *Inter-operability and security for emerging scientific systems ($2 million).* Sophisticated scientific information systems are critical to the continued competitive advantage of the United States. The systems that underlie the Nation's research advances in science and engineering—the "cyberinfrastructure"—are rapidly expanding in all directions. Individual information devices—from radio-frequency ID (RFID) tags to "smart dust" to micro-electro-mechanical systems (MEMS)—are becoming ever smaller, more capable, and more ubiquitous. At the other end of the scale, system complexity—systems of systems of systems—is growing rapidly as well. It is crucial that standards and measurements for reliability, manageability, interoperability and security be included from the beginning of system design to avoid costly retrofits.

  As part of this initiative, NIST will develop the technical support tools required to maximize the performance of future components, systems and networks, including developing metrics and standards for the performance, conformance and usability of complex, multi-modal, distributed scientific systems to ensure inter-operability. NIST will also develop metrics and techniques for characterizing and assessing emerging self-managing system technologies, and develop mathematical models, measurement techniques and control systems capable of detecting and reacting to emergent behaviors in very-large-scale scientific systems. The initiative also calls for NIST to develop test methods and protocols for detecting and reporting malicious tampering of systems and components.
- *Quantum processing—beyond high-end computing ($4 million).* Quantum information science, which seeks to exploit the peculiar characteristics of quantum mechanics to create information processing systems of almost unimaginable power, is likely to revolutionize science and technology on a scale comparable to the introduction of the laser, the integrated circuit, and the computer. Currently intractable problems, such as the factoring of very large numbers to decipher terrorist communications, potentially could be done in less than a second by a quantum computer. On the other hand, quantum cryptography could provide perfectly secure defense communications.

NIST is a leader in fundamental research on quantum information systems, having demonstrated laboratory-scale quantum computing and quantum teleportation systems. There is also a need for a significantly broader program to provide the basic measurement tools and standards for quantum computing and communications systems to support U.S. industry's research and development of quantum systems. Quantum computing also will require the development of whole new approaches to processor and memory control, error management, and component interconnections. Under this initiative, NIST will develop a measurement infrastructure and the fundamental technologies needed to build prototype quantum processors that could be scaled up to true quantum computers, and develop metrics for evaluating alternative computing architectures based on quantum processing.

- *Building competence for advanced measurements ($4 million).* Since the late 1970s, a key element of NIST's planning strategy has been the Building Competence for Advanced Measurements Program, a special research effort enabling NIST to explore key developing areas of science and technology and establish a base of technical expertise on which to build future measurement services. The quantum physics research of NIST's two Nobel laureates, the development of new cold neutron instrumentation that ultimately led to the Institute's unique Cold Neutron Research Facility, and NIST's Biotechnology Division with its pathbreaking research in DNA forensics all were fostered originally by Competence Program funding. The Competence Program is an essential tool giving NIST's research program the necessary agility to adapt to fast-moving scientific developments. The proposed initiative will allow NIST to expand and enhance the existing Competence Program.

Facilities Improvement Plan ($32 million increase)

NIST is engaged in a long-range facility modernization program to make badly needed repairs and upgrades to its physical plant. NIST maintains about 50 specialized laboratories, offices and support buildings at its two major campuses in Gaithersburg, Maryland and Boulder, Colorado. Most of the Gaithersburg structures were built in the 1960s and the Boulder site is a decade older. The aging of these facilities has become a serious impediment to the Institute's mission, hampering not only NIST work on the research frontiers of biotechnology, nanotechnology, and semiconductor technology, but even routine activities such as the calibration of precision pressure gauges used to ensure the accuracy of airplane altimeters and other industrial pressure systems. NIST developed a long-range Facilities Improvement Plan, as well as plans for the thorough renovation of existing structures and a maintenance program designed to address long-term maintenance needs and reduce an extensive backlog of needed maintenance work.

Maintenance for the Advanced Measurement Laboratory ($3.4 million increase)

Completed at the end of 2003, the NIST Advanced Measurement Laboratory (AML) is one of the world's most sophisticated measurement and standards laboratories. Specialized AML labs are able to control environmental factors such as vibration, temperature, humidity, and surface and air cleanliness to the demands of NIST's most advanced research in areas. In some labs, for example, temperature can be controlled to within one-hundredth of a degree Celsius across the entire room.

Maintaining and operating the AML poses special challenges because of the sophisticated and complex mechanical and electrical systems needed to maintain the rigorous environmental controls. Thorough and uncompromising preventive maintenance is required to keep the AML operating as designed and protect the Nation's investment in this unique laboratory. If the clean room mechanical systems ever slip from their exacting design parameters, for example, it will likely cost over $100,000 to decontaminate the clean room and return it to service. This initiative covers the needed increase to NIST's research facilities budget to maintain the AML.

Baldrige National Quality Program ($5.7 million request)

NIST also administers the Baldrige National Quality Program (BNQR). Created by the Congress in 1987, the BNQP has established a standard for performance excellence that helps U.S. businesses and other organizations continuously improve their competitiveness and productivity through rigorous quality and performance management practices.

Only a relative handful of institutions have won the program's centerpiece, the Malcolm Baldrige National Quality Award—since 1988, only 62 Baldrige Awards have been presented to 59 organizations. Nonetheless, the BNQP has had a pervasive influence on U.S. industry, schools and hospitals through the widespread dis-

semination of Baldrige "best practices." Many thousands of organizations use the Baldrige criteria internally to assess and improve their performance, deliver greater value to their customers, and improve overall organizational effectiveness. The BNQP has been copied widely by state governments and other countries.

The Baldrige Award originally had categories for manufacturing, service, and small business. In 1999, the award was expanded to include categories in education and health care. In 2004, the award was expanded to include all non-profit organizations, including Federal, State and local government organizations.

Hollings Manufacturing Extension Partnership ($46.8 million request)

Since 1988, the Hollings Manufacturing Extension Partnership (HMEP) at NIST has fostered a federal-State-local partnership program to give small and medium sized manufacturers a nationwide network of not-for-profit centers to help them become more competitive and productive. HMEP centers serve all 50 States and Puerto Rico, promoting lean manufacturing techniques such as zero-defect quality programs, and helping even the smallest firms tap into specialists from across the country with manufacturing and business expertise in plant operations and on manufacturing floors. The FY 2006 budget request will fund the program at $46.8 million. At this level, the Administration will maintain a national network of centers, while focusing funding based on a center's performance and need.

Advanced Technology Program ($0 request)

Since 1990, the Advanced Technology Program has used cost-shared awards to encourage industry investment in high-risk, innovative technology R&D that promise broad benefits to the Nation. While the program has sponsored successful research projects over the years, this budget proposes terminating the program in favor of more appropriate and higher-priority needs of government funding. Our budget request reflects our belief that the NIST core laboratory programs have a much higher priority than the ATP because they support the fundamental science and technology needs of U.S. businesses, workers and the U.S. economy.

National Oceanic and Atmospheric Administration Programs

Americans look to NOAA for an incredible variety of services and support ranging from the local weather forecast, to a sustainable supply of quality seafood, to the safe transport of millions of tons of weatherborne cargo. NOAA also helps to keep the coastline safe and vibrant, and to maintain detailed research on the climate from the frozen arctic to the depths of the oceans. NOAA's Strategic Plan highlights focal areas for research under each of the agency's four major cross-cutting strategic goals: ecosystems, climate, weather and water, and commerce and transportation. NOAA's FY 2006 budget request includes several initiatives that are research driven or science based which are set out below in the context of NOAA's four major strategic goals. I would like to begin by highlighting the Global Earth Observation System of Systems (GEOSS), a program that brings together elements of all four strategic goals.

Global Earth Observations ($94.7 million increase)

NOAA's FY 2006 budget includes increases of approximately $94.7 million to support requirements to build an integrated Earth observing system, the GEOSS. Included in these efforts is the $65.6 million requested for NOAA's Geostationary and Polar Orbiting Satellites, and the $9.5 million to expand the U.S. Tsunami Warning Network. The new 'system of systems' will "take the pulse of the planet" by providing critical scientific data needed to address important global economic, social and scientific challenges. With this improved knowledge, decision-makers around the world will be able to make more informed decisions regarding climate, the environment, and a host of other economic and social issues that are affected by Earth's systems.

Ecosystems ($74.52 million increase)

DOC requests an increase of $1.5 million to improve the condition of coral reefs through support and implementation of locally driven three-year action strategies in order to translate the broad national goals proposed by the U.S. Commission on Ocean Policy into action. The strategies are roadmaps for collaborative and cooperative action among federal, state or territory and nongovernmental partners to address specific threats to coral reef ecosystems, including land-based sources of pollution, recreational overuse, lack of public awareness, climate change, coral bleaching, disease, and issues addressed by fisheries management, such as over-fishing.

DOC requests a net increase of $5.5 million for economic and social science research to expand the agency's data collection capabilities. This is critically important in the area of fishery management. With the funds requested, NOAA expects

to 1) complete economic analyses on commercial harvesters for 26 Fisheries Management Plans (FMP) by FY 2006—a 46 percent increase over FY 2005 projections; 2) complete profiles on 20 fishing communities—a threefold increase from FY 2005; and 3) estimate economic impacts on recreational and commercial fisheries that are economically displaced in 20 federal marine managed areas—also a threefold increase from FY 2005. DOC also requests $32.5 million for a fourth Fisheries Survey Vessel (FSV 4) that will deploy state-of-the-art acoustic technologies to enhance our ability to collect fish stocks data to protect marine mammals.

DOC requests $61.2 million to sustain the operations of the National Sea Grant College Program in FY 2006 to continue development of a system of regional networks to organize multi-state responses to regional/ecosystem-level problems.

DOC is also requesting level funding of $22.7 million to sustain the operations of the Ocean Exploration Program. This program seeks to increase our national understanding of unknown or poorly known ocean systems and processes by conducting 25–30 expeditions per year. In FY 2005, the program will purchase a remotely operated vehicle (ROV) and other infrastructure for NOAA's first designated exploration vessel, which is scheduled for sea trials in 2007. With this infrastructure in place, NOAA will be able to devote funding to support an expanded set of expeditions and projects.

DOC also requests an increase of $2.5 million for the Aquatic Invasive Species (AIS) Program. Zebra mussels have cost the Great Lakes region $3 billion over the past decade, and they are just one of hundreds of invasive species threatening the health of the Great Lakes ecosystem.

DOC requests an increase of $1.6 million for its Marine Aquaculture Program. This increase will spur environmentally safe domestic marine aquaculture production, and help to offset the current $7 billion annual U.S. trade deficit in seafood; will help in rebuilding wild fisheries stocks; and will enhance job creation in both the production and processing of fishery products, thereby revitalizing communities devastated by collapsing fisheries industries.

Climate ($36.8 million increase)

DOC is requesting additional funds for its climate programs, including an $18 million increase to support the President's Climate Change Science Plan. This includes the following initiatives:

- an increase of $3.2 million to conduct further research on the Tropical Atmosphere Ocean (TAO) array of buoys and the Pilot Research Moored Array of buoys in the Tropical Atlantic (PIRATA). This funding will expand the TAO array into the Indian Ocean and support the technological development of the next generation of moored buoys.
- $2 million to develop new climate re-analysis datasets that will enable us to explain more adequately the causes of observed climate variability and change. These datasets will substantially reduce current uncertainty about historical climate variations and improve our ability to analyze and detect interannual-to-decadal variability and weather-climate trends for the 20th century.
- an increase of $800,000 for the Regional Integrated Sciences and Assessment (RISA) program. This funding will initiate a multi-year research effort to: (1) refine existing regional integrated research and address new issues of importance to decision-making communities in regions currently served; and (2) link, in an integrated manner, climate research and information to decision-making processes in regions not currently supported by NOAA to ensure NOAA is providing effective climate services across the Nation.
- an increase of $3.5 million to continue building and maintaining a global ocean observing system that will accurately document climate-scale changes in ocean heat, carbon and sea level. This effort will complete 55 percent of the ocean observing system, keeping us on track with our international commitment of completing the ocean climate observing system by 2010.
- an increase of $2.1 million for expanded research efforts in Aerosols, Clouds, and Climate Change: Observations and Predictions. This research effort is part of a multi-year program of observations to quantify how aerosols (airborne fine particles) influence climate change by their interactions with clouds. The observations will be used to test, validate, and improve aerosol-cloud and global climate models so that they more accurately represent aerosol-cloud interactions.

- $7.5 million to support other ongoing climate research programs in Climate Research and Observations, Climate Operations, and Climate Data and Information programs.

Weather and Water ($96.2 million increase)

In response to the tragedy that struck Southeast Asia on December 26, 2004, the Administration on January 14, 2005, announced a plan to commit an additional $37.5 million over the next two years to tsunami research and preparedness capabilities. NOAA's portion of the Administration proposal is $24 million over two fiscal years: $14.5 million in FY 2005 and $9.5 million in FY 2006, which will be used to expand the existing six buoy Deep-ocean Assessment and Reporting of Tsunamis (DART) system that forms the Pacific Tsunami Warning Network. The new funds provide for an additional 32 DART buoys by mid-2007—seven in the Atlantic Ocean, Caribbean Basin and Gulf of Mexico, and 25 in the Pacific Ocean. The program will also procure 38 new sea level monitoring/tide gauge stations, provide 24/7 warning coverage at the Richard H. Hagemeyer Pacific Tsunami Warning Center and the West Coast/Alaska Tsunami Warning Center, upgrade 20 seismometers used to improve tsunami detection, and expand the TsunamiReady program to improve community preparedness.

DOC also requests $4 million to begin developing a nationwide water resources forecasting capability that is integrated and leveraged with other federal water agency activities, forming the basis of a national water information system. This initiative provides the water modeling capability to support the U.S. Commission on Ocean Policy mandate for a national water quality monitoring and prediction system. Furthermore, the initiative enables NOAA to deliver a national database of drought analyses and predictions, and generate user friendly Geographic Information Systems (GIS) products for monitoring drought. The initiative will provide water users the ability to assess water availability in real time and make informed decisions to mitigate impacts of extreme water events, such as droughts.

DOC also requests $2.1 million to accelerate nationwide implementation of ozone air quality (AQ) forecasting capability from FY 2009 to FY 2008 and to deliver an initial particulate matter forecasting capability by FY 2011. The effect of poor air quality on the national economy is estimated at $150 billion/year from health effects alone. Accurate air quality forecast guidance, provided in time to take action, can realize significant savings. Due to the magnitude of this impact, even a 0.5 percent change due to air quality forecasting would have a significant effect, saving about $750 million a year nationally.

Commerce and Transportation ($35.1 million increase)

DOC requests a total of $7.5 million to maintain the operations of the Joint Hydrographic Center, established in FY 1999 as a partnership between NOAA and the University of New Hampshire. The Center's activities focus on two major tasks: the creation of a learning center that will promote and foster the education of a new generation of hydrographers and ocean mapping scientists, and research to develop and evaluate a wide range of state-of-the-art hydrographic and ocean mapping technologies and applications.

An increase of $900,000 is requested for the South Carolina Geodetic Survey and the California Spatial Reference Center. South Carolina's exemplary State program works to establish horizontal and vertical geodetic control throughout the State to allow land and land-related items to be referenced to the national horizontal and vertical coordinate system. The Survey's efforts improve land records management, engineering, land planning, and economic development. NOAA's support of the California Spatial Reference Center has enabled the State to develop a plan to establish and maintain an accurate state-of-the-art network of GPS control stations necessary to meet the demands of government and private businesses for a reliable spatial reference system in California. This infrastructure will aid public health and safety, assist in the protection and preservation of natural resources, and improve the productivity of government and private business.

DOC also requests $2 million to implement the National Vertical Datum Transformation tool database, or VDatum. This tool supports NOAA's requirement for hydrographic and shoreline data for our nautical techniques. VDatum will benefit NOAA's modernization efforts in shoreline measurement and hydrographic surveying for navigation safety. In addition, the tool will enable sharing of geospatial data sets among federal/State/local agencies and academia by translating data between disparate reference datums.

CONCLUSION

This completes my statement. The Department's research and development budget includes a number of investments critical to our nation. I look forward to working with you and Members of the Committee in meeting the challenge of finding the necessary funds at a time when the demands on the Federal Budget continue to increase.

Thank you for the opportunity to appear here today to present the Department's R&D budget. I would be pleased to answer any questions you may have.

BIOGRAPHY FOR THEODORE W. KASSINGER

Theodore W. (Ted) Kassinger serves as Deputy Secretary of the U.S. Department of Commerce, a position to which he was nominated by President George W. Bush in February 2004 and confirmed by the Senate on November 21, 2004. Previously, Mr. Kassinger was nominated and confirmed by the U.S. Senate as the General Counsel of the Department. He served in that capacity from May 2001 until assuming his current position.

As Deputy Secretary, Mr. Kassinger serves as the Department's Chief Operating Officer, with responsibility for the day-to-day management of its approximately $6.5 billion budget, 13 operating units, and 38,000 employees. Among the Department of Commerce's varied missions are promoting U.S. exports, administering unfair trade laws, and negotiating and enforcing international trade agreements; regulating the export of sensitive goods and technologies and promoting international cooperation on export control and strategic trade matters; serving as effective stewards of the Nation's ocean, coastal, and living marine resources while assisting their economic development; forecasting the weather and conducting other climate research; formulating technology and telecommunications policy and administering the federal radio frequency spectrum; conducting the national censuses and producing some of the Nation's most important economic data; administering the patent and trademark system; developing and applying technology, measurements, and standards; and promoting economic growth in distressed communities and minority business development. As Deputy Secretary, Mr. Kassinger supports Secretary of Commerce Donald L. Evans in carrying out these Department responsibilities and other Departmental policy and operational objectives.

Prior to joining the Bush Administration Mr. Kassinger practiced law with the multinational law firm, Vinson & Elkins, L.L.P., from 1985 to 2001. His law practice focused mainly on the fields of international trade and business law, and transnational disputes resolution. Earlier in his career, Mr. Kassinger served as an attorney for the U.S. Senate Committee on Finance, the U.S. Department of State, and the U.S. International Trade Commission.

A native of Atlanta, Georgia, Mr. Kassinger received his B.L.A. from the University of Georgia School of Environmental Design (1975) and his J.D. from the University of Georgia School of Law (1978). He is married to the author, Ruth G. Kassinger. The Kassingers are the parents of three daughters.

Chairman BOEHLERT. Thank you, sir, very much.

Dr. McQueary.

STATEMENT OF DR. CHARLES E. McQUEARY, UNDER SECRETARY FOR SCIENCE AND TECHNOLOGY

Dr. MCQUEARY. Thank you, Mr. Chairman, Ranking Member Gordon, and distinguished members of the Committee. It is a pleasure to be here today to discuss the research and development activities of the Department of Homeland Security Science and Technology Directorate. And Mr. Chairman, thank you, again, for your foresight in recognizing the need to have the Science and Technology Directorate to be a part of the Homeland Security Department.

The Nation's advantage in science and technology is key to securing the homeland. The most important mission for the Science and Technology Directorate is to develop and deploy cutting-edge technologies and new capabilities so that the dedicated men and

women who serve to protect and secure our homeland can perform their jobs more effectively and efficiently.

I would like to give you just a quick summary of some of the accomplishments that we have achieved since the last time I was before you. And I will list those in order.

We have developed and documented a robust research development testing and evaluation process that includes risk-based planning, and you will see some of the effects of that as we have adjusted the recommended funding levels across our portfolios. We have continued the daily operation and maintenance and deployment of BioWatch, which has been exceedingly successful for us so far. We selected four cities for the deployment of a new pilot program entitled the Regional Technology Integration initiative, which was formerly called "Safe Cities." We have selected over 100 undergraduate and graduate students in the fall of 2004 for grants to assist the study of science and technology issues that support the homeland security mission. We launched three Homeland Security Centers of Excellence to date with contract negotiations taking place for the fourth. We issued ten major R&D solicitations to industry through the first 20 months of our existence and issued more than 200 contracts to do research work on behalf of the Department. We stood up the Department's Office of Inter-operability and Compatibility, and we collaborated—and I think this is a key issue—we collaborated and assisted with other components of the Department to enhance their abilities to meet their missions. And I can tell you, Mr. Chairman, I believe that the Department elements recognize the importance of science in the missions that they have to accomplish.

As I mentioned, the Science and Technology RDT&E—the Directorate's RDT&E process uses a risk-based approach to planning and is oriented towards identifying critical capability gaps before attempting to identify or develop technology solutions. The process engages the end-user, the operational units, throughout the requirements, definition, development, testing, and transition, and the process considers the product life cycle from the outset, including planning and budgeting for production, deployment, operations, and support. It is this process which allows us to prioritize both within and across fields and our programs are derived from this process.

The Science and Technology Directorate has organized its efforts into research and development portfolios that span the set of product lines of the Directorate. Four portfolios address the development of countermeasures for specific terrorist threats: biological countermeasures, chemical countermeasures, explosive countermeasures, and radiological and nuclear countermeasures.

We have four portfolios that support the operational units of the Department. We have the standards, emerging threats, and rapid prototyping portfolios that crosscut all of the terrorist threats and enhance the research and development conducted in the countermeasures portfolios.

The Directorate has three portfolios that focus on the protection of the Nation's vital infrastructure and those are threat and vulnerability, testing and assessment, and critical infrastructure protection in cyber security, an area I know that is very important to

you and to other Members of the Committee. The Directorate addresses many other areas as well, such as our university and fellowships program. We have a Counter–MANPADS program that is seeking to improve technologies to protect commercial aircraft from the threat of man-portable air defense systems. The Office of Interoperability and Compatibility, which is managed by the S&T group, oversees the wide range of public safety inter-operability programs and efforts currently spread across homeland security. The proposed new Domestic Nuclear Detection Office is being established to be a single entity responsible for coordinating and extending our national efforts in nuclear and radiological detection.

At this time, I would like to briefly describe some of our 2006 plans. In my written testimony, I have included a listing of 2004 accomplishments. In many of the things that we have done, it goes into far more detail.

The S&T Directorate has requested an overall fiscal year 2006 budget of $1.368 billion, which is an increase of $253 million, or 22.7 percent over the fiscal year 2005 budget. And this request includes funding for requirements, review and construction planning for the National Bio and Agro Defense Facility, the development of a low-volatility agent warning system, a radiological and nuclear countermeasures testing and evaluation complex, additional development of the Counter–MANPADS system, and the consolidation of the Department's RDT&E units.

Let me just touch quickly upon the Homeland Security Institute, because I think there may be questions about that later. The Homeland Security Institute was stood up. It is an FFRDC unit in support of the entire Department, not just science and technology. An important contribution that they are making to us now is to begin to examine the overall system architecture for how we will put the various elements of the homeland security system together to work as a system rather than as a piece parts, where we have in some cases now.

We continue to be active participants in several ongoing interagency working groups, and we may get a chance to talk about some of those, but I think what I will do is wrap this up now so we can get to the questions and answers, because I know that is where we will have a chance to have an open dialogue.

So Mr. Chairman, Ranking Member Gordon, thank you very much for the opportunity to be here.

[The prepared statement of Dr. McQueary follows:]

PREPARED STATEMENT OF CHARLES E. MCQUEARY

Introduction

Good morning. Chairman Boehlert, Congressman Gordon, and distinguished Members of the Committee. It is a pleasure to be with you today to discuss the research and development activities of the Department of Homeland Security's (DHS's) Science and Technology (S&T) Directorate.

The Nation's advantage in science and technology is key to securing the homeland. The most important mission for the Science and Technology Directorate is to develop and deploy cutting-edge technologies and new capabilities so that the dedicated men and women who serve to protect and secure our homeland can perform their jobs more effectively and efficiently—these men and women are my customers.

When I last reported to you about our activities, we were just over one year old as a Department. Since my last report, the Science and Technology Directorate has:

1) Developed and documented a robust Research, Development, Testing and Evaluation (RDT&E) process that includes risk-based planning for the S&T Directorate's programs and initiatives.
2) Continued daily operation, maintenance and deployment of BioWatch, a biological agent detection system, to protect the Nation's major population centers from the threat and ramifications of a bioterrorist attack. BioWatch also provided support during the G8, Democratic National Convention and Republican National Convention.
3) Selected four cities for the deployment of a new pilot program entitled the Regional Technology Integration (RTI) initiative (formerly "Safe Cities"). The selected cities include: Memphis, TN; Anaheim, CA; Cincinnati, OH; and Seattle, WA. RTI provides an integrated urban all-hazards detection and emergency response system.
4) Established a dedicated National Bioforensics Center to support ongoing Federal Bureau of Investigation (FBI) and other law enforcement investigations.
5) Established the National Visualization and Analytics Center and the Biological Knowledge Center to improve the analysis of information and close knowledge gaps.
6) Established a test and evaluation capability for Radiological/Nuclear Countermeasures at the Nevada Test Site.
7) Selected over 100 undergraduate and graduate students, in the fall of 2004, for grants to assist in the study of science and technology issues that support the homeland security mission.
8) Launched three Homeland Security Centers of Excellence to date with negotiations taking place for a fourth and the solicitation released for the fifth.
9) Issued ten major R&D solicitations to industry and academia through the first 20 months and issued more than 200 contracts for research work to date.
10) Collaborated with and assisted other components of the Department to enhance their abilities to meet their missions and become active contributors in interagency working groups—all while staffing this Directorate with some of this country's brightest and most dedicated people.
11) Awarded four SAFETY Act designations and certifications, received and responded to 72 full applications and 166 pre-applications, and worked to streamline the process.
12) Stood up the Department's Office of Inter-operability and Compatibility to address the wide range of public safety inter-operability programs and efforts currently spread across Homeland Security.
13) RapidCom improved incident-level, inter-operable emergency communications in ten high-threat urban areas by helping to establish command-level inter-operability within an hour or less.
14) Completed Phase I of the Counter–MANPADS Program and initiated Phase II which will advance the studies initiated in phase I, build system prototypes and conduct effectiveness testing.

I continue to be energized by and proud of the scientists, engineers, managers, and support staff in the Science and Technology Directorate. We have accomplished a great deal in a short amount of time and are positioning the Directorate to make continuing contributions to the homeland security mission of the Department.

However, the threats to our homeland remain diverse and daunting. We must constantly monitor current and emerging threats and assess our vulnerabilities to them, develop new and improved capabilities to counter them, and mitigate the effects of terrorist attacks should they occur. The Science and Technology Directorate must also enhance the conventional missions of the Department to protect and provide assistance to civilians in response to natural disasters, law enforcement needs, and other activities such as maritime search and rescue. Basically we assist in making DHS operations science based, intelligence informed and technology enabled.

The Science and Technology Directorate's Research, Development, Testing, and Evaluation Process

As I just mentioned, one of the Directorate's accomplishments over the last year was the development and documentation of a robust Research, Development, Testing, and Evaluation (RDT&E) process. The goal of the RDT&E process is to provide

a clearly defined, repeatable method for assessing needs and risk, planning, allocating resources and executing programs to produce high-impact, cost-effective and critically needed homeland security technology solutions.

The S&T Directorate's RDT&E process uses a risked-based approach to planning and is oriented toward identifying critical capability gaps before attempting to identify or develop technology solutions. In developing solutions, the process engages the end-user throughout requirements definition, development, testing and transition. The process considers the product life cycle from the outset, including planning and budgeting for production, deployment, operations and support. It is this process which allows us to prioritize both within and across fields.

RDT&E consists of four main sub-processes: 1) needs and risk assessment, 2) strategic planning, 3) program definition, and 4) program execution. The first two subprocesses ensure that the Science and Technology Directorate considers user needs, available intelligence, big-picture risks, national goals and inputs from other external agencies and advisory bodies to establish its annual RDT&E program. The second two sub-processes provide a framework for program execution using the best available systems engineering and program management techniques.

Science and Technology Directorate Organization

We have four key offices in the Science & Technology Directorate, each of which has an important role in implementing the Directorate's research, development, testing and evaluation (RDT&E) activities. These offices are: Plans, Programs, and Budget (PPB); Office of Research and Development (ORD); Homeland Security Advanced Research Projects Agency (HSARPA); and Systems Engineering and Development (SED). In addition, the S&T Directorate houses the Office of Weapons of Mass Destruction Operations and Incident Management to offer scientific advice and support to meet operational needs.

Crosscutting the four key offices, the Science and Technology Directorate implements its activities through focused portfolios that address biological, chemical, explosives, radiological and nuclear, and cyber threats; support the research and development needs of the operational units of the Department; support the development of standards and inter-operability; develop an enduring R&D capability for homeland security; and receive valuable input from private industry and academia as well as national and federal laboratories. I will talk about the offices first and then about the portfolios.

Office of Plans, Programs, and Budget

PPB is organized into the portfolios I just mentioned, each of which is focused on a particular discipline or activity; taken together, these portfolios span the Directorate's mission space. As I will cover the portfolios in detail later in this testimony, I will limit myself here to a summary explanation. The staff of each portfolio is charged with being expert in their particular area; with understanding the activities and capabilities extant in federal agencies and across the broad research and development community; and with developing a strategic plan for their particular portfolio, to include near-, mid-, and long-range research and development activities. In addition, we have staff that is charged with understanding the threat from a technical perspective, with integrating the various portfolios into a coherent overall plan, and with developing the corresponding budget and monitoring its financial execution.

Finally, PPB is responsible for executing the Directorate's implementation responsibilities for the SAFETY (Support Anti-Terrorism by Fostering Effective Technologies) Act.

Office of Research and Development

ORD provides the Nation with an enduring capability in research, development, demonstration, testing and evaluation of technologies to protect the homeland. ORD builds enduring RDT&E capability through stewardship of the homeland security comple—people, places, and programs—to anticipate, prevent, respond to and recover from terrorist attacks.

Activities within ORD address the resources that can be brought to bear to better secure the homeland through the participation of universities, national laboratories, federal laboratories and research centers.

Homeland Security Advanced Research Projects Agency

HSARPA is an external research-funding arm of the Science and Technology Directorate. It has at its disposal a full range of contracting vehicles and the authority under the Homeland Security Act of 2002 to engage businesses, federally funded research and development centers, universities, and other government partners in

performing its mission to gather, generate and develop ideas, concepts and advanced technologies to protect the homeland.

HSARPA's mission is to support basic, applied, and advanced homeland security research to promote revolutionary changes in technologies that would promote homeland security; advance the development, testing and evaluation, and deployment of homeland security technologies; and accelerate the prototyping and deployment of technologies that would address homeland security vulnerabilities. Its customers are State and local first responders and federal agencies that are allied with homeland security such as the U.S. Coast Guard, U.S. Secret Service, U.S. Citizenship and Immigration Services, Federal Emergency Management Agency, and others.

About 60 percent of the Science and Technology Directorate's appropriation in FY 2005 will be executed directly through the private sector, with HSARPA managing about 40 percent of that.

Office of Systems Engineering and Development

SED is tasked with leading the implementation and transition of large-scale or pilot systems to the field through a rapid, efficient and disciplined approach to project management.

One of the Science and Technology Directorate's challenges is to evaluate a wide spectrum of military and commercial technologies so rapid, effective and affordable solutions can be transitioned to the Department's customers that include first responders and federal agencies. In some cases, military technologies could be candidates for commercialization, but rigorous systems engineering processes need to be applied to ensure a successful transition. SED's role is to identify and then, in a disciplined manner, reduce risks associated with such technologies to ready them for deployment to the field. In doing so, the office must view each technology through the prism of affordability, performance and supportability—all critical to end-users.

SED must weigh considerations such as the urgency for a solution, consequences of the threat, safety of the product, and life cycle support as new products are introduced. Products must be user friendly, have a minimum of false alarms, require little or no training and consistently provide accurate results. SED will demonstrate and test solutions before they are released to the field, and will validate that those solutions meet user expectations. SED also operates our Countermeasures Test Bed capability, which provides end-user "in the loop" operational testing and evaluations to the Directorate's portfolios.

Office of Weapons of Mass Destruction Operations and Incident Management

We created the Office of Weapons of Mass Destruction Operations and Incident Management as the Science and Technology Directorate's operational arm for DHS support to incident management. Through this Office, the Science and Technology Directorate exercises its scientific and technical leadership role under the National Response Plan. This Office provides rapid scientific and technical expertise and executive decision support to the Secretary, DHS response units, interagency partners, and the State and local jurisdictions that form the front line response to chemical, biological, radiological, nuclear and high-explosives threats and incidents.

Results From Current Research and Development (R&D) Spending and FY 2006 Plans: Portfolio Details

The Science and Technology Directorate has organized its efforts into research and development portfolios that span the set of product lines of the Directorate. Four portfolios address the development of countermeasures for specific terrorist threats: Biological Countermeasures, Chemical Countermeasures, Explosives Countermeasures, and Radiological and Nuclear Countermeasures.

In addition to the countermeasures portfolios, four portfolios support the operational units of the Department: Border and Transportation Security (BTS), Emergency Preparedness and Response (EPR), United States Coast Guard (USCG) and United States Secret Service (USSS) portfolios.

The Standards, Emerging Threats, and Rapid Prototyping portfolios crosscut all terrorist threats and enhance the research and development conducted in the countermeasures portfolio.

The Directorate has three portfolios that focus on the protection of the Nation's vital infrastructure: Threat and Vulnerability, Testing and Assessment, Critical Infrastructure Protection and Cyber Security.

The S&T Directorate addresses other areas as well:

- Our University and Fellowship Programs portfolio addresses the need to build an enduring science and technology capability and support United States leadership in science and technology.
- Our Counter–MANPADS program is seeking to improve technologies to protect commercial aircraft from the threat of MAN-Portable Air Defense Systems (MANPADS).
- The Office of Inter-operability and Compatibility (OIC), managed by the Science and Technology Directorate, oversees the wide range of public safety inter-operability programs and efforts currently spread across Homeland Security, including critical inter-operability issues relating to public safety and emergency response, including communications, equipment, training, and other areas as needs are identified.
- The Domestic Nuclear Detection Office (DNDO) is being established to be the single entity responsible for coordinating and extending efforts in nuclear/radiological detection. This office will consolidate functions within the Department of Homeland Security and establish strong linkages across the interagency for the deployment of a national domestic nuclear detection architecture, the conduct of transformational research and development, and the establishment of protocols and training for the end users of equipment developed and deployed through the new office.

At this time I would like to briefly describe some of our accomplishments to date and our FY 2006 plans. As can be seen in the following chart, we have an overall FY 2006 budget request of $1.368 billion, which is an increase of $253.0 million (22.7 percent) over the FY 2005 levels. The request includes the construction of the National Bio and Agrodefense Facility, the development of a Low-Volatility Agent Warning System, a Radiological/Nuclear Countermeasures Testing and Evaluation Complex, additional development of Counter-Man-Portable-Air-Defense Systems (C–MANPADS), and the consolidation of the Department's RDT&E activities.

	FY 2004	FY 2005	Proposed	Increase/Decrease	
	Actual	Enacted	FY 2006	From FY 2005 to 2006	
BUDGET ACTIVITY	Amounts (millions)	Amounts (millions)	Amounts (millions)	Amounts (millions)	Percent Increase
Management and Administration	43.9	68.6	81.4	12.8	18.7%
Bio Countermeasures	162.6	362.6	362.3	(0.3)	-0.1%
NBACC*	4.3	35.0	-	(35.0)	-100.0%
Chemical Countermeasures	22.9	53.0	102.0	49.0	92.5%
Explosives Countermeasures	7.0	19.7	14.7	(5.0)	-25.4%
Radiological and Nuclear Countermeasures	105.7	122.6	19.0	(103.6)	-84.5%
Domestic Nuclear Detection Office			227.3	227.3	
Threat and Vulnerability, Testing and Assessments	58.7	65.8	47.0	(18.8)	-28.6%
Standards	32.2	39.7	35.5	(4.2)	-10.6%
Support of Department of Homeland Security Components	20.8	54.7	93.7	39.0	71.3%
University and Fellowship Programs	22.0	70.0	63.6	(6.4)	-9.1%
Emerging Threats	11.2	10.7	10.5	(0.2)	-1.9%
Rapid Prototyping	68.4	76.0	20.9	(55.1)	-72.5%
Counter MANPADS	16.7	61.0	110.0	49.0	80.3%
SAFETY Act	-	10.0	5.6	(4.4)	-44.0%
Office of Interoperability and Compatibility	-	21.0	20.5	(0.5)	-2.4%
Critical Infrastructure Protection	12.1	27.0	20.8	(6.2)	-23.0%
Cyber Security	10.3	18.0	16.7	(1.3)	-7.2%
Research and Development Consolidation	-	-	116.9	116.9	
Total enacted appropriations and budget estimates	598.8	1,115.4	1,368.4	253.0	22.7%

*Includes construction costs

Biological Countermeasures

Biological threats can take many forms and be distributed in many ways. Aerosolized anthrax, smallpox, foot and mouth disease, and bulk food contamination are among the threats that can have high consequences for humans and agriculture. Our Biological Countermeasures portfolio uses the Nation's science base to prevent, protect, respond to, and recover from bioterrorism events. This portfolio provides the science and technology needed to reduce the probability and potential consequences of a biological attack on this nation's civilian population, its infrastructure, and its agricultural system. Portfolio managers and scientists are developing and implementing an integrated systems approach with a wide range of activities, including

vulnerability and risk analyses to identify the need for vaccines, therapeutics, and diagnostics; development and implementation of early detection and warning systems to characterize an attack and permit early prophylaxis and decontamination activities; and development of a national bioforensics analysis capability to support attribution of biological agent use.

In FY 2004 and FY 2005, the Biological Countermeasures portfolio:

- Deployed the BioWatch environmental sensor system to protect our nation's cities from the threat and ramifications of a bioterrorist attack. BioWatch activities were significantly increased during the National Code Orange Alert (December 2003–January 2004), with twice daily samplings in the high threat cities, additional collectors for special New Year's events and Bowl Games, and deployment of temporary BioWatch systems to non-BioWatch cities of special concern. BioWatch also provided field and laboratory support to the G8, the Democratic National Convention and the Republican National Convention in Boston and New York.
- Engaged in creating more near real-time monitoring of critical infrastructure facilities such as major transportation hubs. New infrastructure protection efforts include shorter response time biological agent detection capabilities for BioWatch. This pilot is in the process of being deployed in New York City and will join a three-to-five expansion of the number of collectors in that city.
- Initiated the design of the National Biosurveillance Integration System (NBIS) as part of an interagency process. Recently completed in the first quarter of FY 2005, we will work with the Information Analysis and Infrastructure Protection (IAIP) Directorate to implement this system.
- Conducted preliminary analyses, using the reference scenario approach recommended by Homeland Security Presidential Directive (HSPD)–10 for understanding the requirements of an integrated national biodefense architecture, of four baseline reference cases: a large outdoor release of a non-contagious agent (anthrax); a large indoor release of a contagious agent (smallpox); contamination of a bulk food supply; and two highly virulent agricultural attacks, one on livestock (Foot and Mouth Disease) and the other on plants (soy bean rust).
- Established the Biodefense Knowledge Center, an operational hub for enabling collaboration and communication within the homeland security complex. The Biodefense Knowledge Center will meet the operational and planning requirements of government decision-makers and program planners, the intelligence community, law enforcement officers, public health practitioners, and scientists. Specific capabilities offered to these end-users include knowledge services, modeling and simulation, situational awareness and a pathway to accelerate research and development.

In FY 2006, the Biological Countermeasure portfolio plans to:

- Complete the three high level architectures initiated in FY 2005 (multiple small attacks, an engineered organism, and an intentional spread of a zoonotic disease), identifying key requirements for each major element, a "report card" on the current and projected status in that area and performing detailed design tradeoffs for those areas in which DHS has execution responsibility.
- Complete the first formal risk assessment required under HSPD–10 and close many of the key remaining experimental gaps in our knowledge of the classical biological threat agents. Near-, mid-, and long-term plans for dealing with engineered agents will be developed, and R&D on addressing the gaps in responding to modified organisms (e.g., antibiotic resistant) initiated.
- Complete the deployment of Generation 2 BioWatch systems to the top threat cities while continuing to operate and optimize already extant BioWatch systems. Complete test and evaluation of laboratory prototypes of the Generation 3 BioWatch detection systems which will be ready for down-selection those which will go on to develop fieldable prototypes in FY 2007.
- Continue operation of the interim National Bioforensic Analysis Center. International Organization for Standardization (ISO) certification is expected to have been achieved, giving the analyses conducted additional credibility and authenticity in both the national and international community and courts of law. R&D will continue on the physical and chemical signatures of the "matrix" materials associated with biological agents so as to develop methods for understanding tell-tale remnants of enrichment media, culture conditions, metabolites, and dispersion technology.

- Continue operation of the Plum Island Animal Disease Center (PIADC) and essential upgrades to the facility and initiate design of the National Bio and Agrodefense Facility (NBAF). R&D will continue on next generation vaccines and antiviral therapeutics for foot and mouth disease (FMD) and other high priority foreign animal diseases.
- Continue to develop bioassays for FMD and look-alike animal diseases. The initial agricultural forensic capability established in FY 2004 at PIADC will be enhanced and epidemiologic capability added. A High Throughput Diagnostics Demonstration will be initiated to work with regional and State laboratories to demonstrate a capability of analyzing thousands of samples per day in support of response to a suspected case or an outbreak. A FMD table top exercise of DHS Directorates will be initiated, and development of a coupled epidemiological and economic model for FMD will begin. The end-to-end systems study initiated in FY 2004 for Soybean Rust and FMD will be completed, and system studies initiated for highly pathogenic avian influenza.

National Bio-Defense Analysis and Countermeasures Center (NBACC)

The NBACC, a key component of the *National Strategy for Homeland Security,* addresses the need for scientific research to better anticipate, prevent, and mitigate the consequences of biological attacks. The need for the NBACC facility is further defined in the Presidential Directive *Biodefense for the 21st Century,* the Nation's blueprint for future biodefense programs. The NBACC's mission will support two pillars of this blueprint—threat awareness and surveillance and detection. The NBACC is made up of two centers, the Biological Threat Characterization Center and the National Bioforensic Analysis Center to carry out these missions. Specifically, NBACC's mission is to:

- Understand current and future biological threats, assess vulnerabilities, and determine potential impacts to guide the research, development, and acquisition of biodefense countermeasures such as detectors, drugs, vaccines and decontamination technologies; and
- Provide a national capability for conducting forensic analysis of evidence from bio-crimes and terrorism to attain a "biological fingerprint" to identify perpetrators and determine the origin and method of attack.

In FY 2004, the Department completed the planning and conceptual design of the NBACC facility. Additionally, the Department has been working through the National Environmental Policy Act (NEPA) process during the year, which culminated in the signing of the Record of Decision in January 2005 of the Final Environmental Impact Statement (EIS) for the construction project and subsequent operations. It was decided to delay the award of any contracts for design and construction until further in the EIS process. As the public concerns are analyzed and considered it is anticipated that contracts will be awarded in FY 2005 to initiate design and construction of the NBACC facility.

In FY 2005, the solicitations of contracts for the design and construction of the NBACC facility are expected to be awarded. The design of the NBACC facility will commence in March 2005. $35M was appropriated to obligate funds for award of the construction contract in the fourth quarter of FY 2005. Construction of the facility is planned for completion by the fourth quarter of FY 2008.

In FY 2006, funding was not requested for the construction of the NBACC facility.

Chemical Countermeasures

The National Research Council Report, *Making the Nation Safer,* points out that "chemicals continue to be the weapon of choice for terrorist attacks." Until recently, the chemical threat spectrum was limited to the threats posed by chemical warfare agents (CWAs) in a military context and the threats posed by the accidental or inadvertent release of toxic materials in the homeland domain. Now, the chemical threat spectrum has expanded to include chemical warfare agents (CWAs), toxic industrial chemicals (TICs), non-traditional agents (NTAs) and toxins. As with the threat materials themselves, the range of potentially attractive targets is large. The potential for chemical warfare agents and emerging threat agents constitute a broad range of threats that may be applied to virtually any civilian target.

The Chemical Countermeasures portfolio works to enhance the Nation's capability to anticipate, prevent, protect, respond to and recover from chemical threat attacks through interagency leadership and conduct of innovative research, development, and technology transition. The portfolio works through the interagency environment to shape a comprehensive strategy for enhancing the Nation's defensive posture and to develop bases for enhanced R&D program integration and leverage. The R&D ac-

tivities include prioritization of efforts among the many possible chemical threats and targets, and development of new detection and forensic technologies and integrated protective systems for high-value facilities such as airports and subways. These activities are informed by end-user input and simulated exercises.

In FY 2004 and FY 2005, the Chemical Countermeasures portfolio:

- Conducted preliminary activities toward the development of a Chemical Security Analysis Center (CSAC) that will provide threat awareness and assessment. An overall structure, similar to that characterizing the NBACC and its supporting threat characterization, forensics, knowledge management and reachback, is envisioned.
- Initiated system studies around three defining scenarios: indoor chemical agent release, outdoor toxic industrial chemical release, and release of toxin in the water system.
- Initiated three demonstration projects: the Facility Restoration Demonstration Project to develop and demonstrate a capability to rapidly restore a facility that has been contaminated with a classical chemical agent or persistent toxic industrial chemical (TIC); a Water Security Demonstration to identify and characterize technologies with the potential to provide warning of chemical contamination of the water system; and a National Security Special Event (NSSE) Deployable Detection System Demonstration to develop a flexible architecture chemical detection system that can be utilized for the warning and situational awareness of chemical threats in temporary deployments.
- Initiated key development programs targeting leap-ahead advancements in detection capabilities. These programs will develop two principal capabilities: a facility monitoring detector and a responder detection tool. In both cases, the detectors will provide detection and discrimination of up to 20 different chemical threats, including classical chemical warfare agents (CWAs) and toxic industrial chemicals (TICs) in a single unit across a wide range of concentrations.

In FY 2006, the Chemical Countermeasure portfolio plans to:

- Reach full operational status at the CSAC where chemical threat databases will be centrally located and accessible.
- Complete technology down-select and draft candidate decontamination protocols in concert with the Environmental Protection Agency (EPA) through the Facility Restoration Technology Demonstration. Transition the Water Security Demonstration to EPA for continuation and conduct technology down-select for the next-generation deployable capability through the NSSE Technology Demonstration.
- Complete the critical design review of technologies for the rapid facility monitor and the first responder tool and conduct a technology down-select supporting prototype selection and build.
- Initiate and demonstrate operational solutions to the challenge of decontaminating non-traditional agents and initiate next-generation decontamination research.

Explosives Countermeasures

The Explosives Countermeasures portfolio addresses the threat that terrorists will use explosives in attacks on buildings, critical infrastructure, and the civilian population of the United States. The Science and Technology Directorate's Explosives portfolio has been closely coordinated with the activities ongoing in the Transportation Security Administration to ensure that research and development (R&D) activities are complementary, not duplicative; in FY 2006, these activities will be consolidated within the S&T Directorate. R&D priorities in the Explosives Countermeasures portfolio focus on the detection of vehicle bombs and suicide bombers and on providing the science and technology needed to significantly increase our ability to prevent an explosives attack on buildings, infrastructure or people.

In FY 2004 and FY 2005, the Explosives Countermeasures portfolio:

- Addressed terrorist attacks against buildings and the general population. The portfolio initiated the development of a prototype explosive detector for vehicle bombs, and accelerated the development of hardened overhead storage bins for passenger aircraft. Additionally, it initiated a survey and evaluation of commercial-off-the-shelf equipment to detect, interdict and mitigate the consequences of suicide bombers and vehicle bombs, and conducted a cost-benefit analysis of approaches to aircraft hardening.

- Funded the demonstration in FY 2005 of the capabilities identified in FY 2004, used to provide the ability to detect, interdict, and mitigate the consequences from suicide bombers, truck, and car bombs approaching high profile targets and densely populated areas.

In FY 2006, the Explosives Countermeasure portfolio plans to:

- Continue to consolidate explosives management functions as outlined above. Efforts will focus on developing the ability to detect, interdict and mitigate the consequences from suicide bombers, truck and car bombs approaching high profile targets and densely populated areas. Additonally, the portfolio will provide the ability to detect, interdict and mitigate the consequences of explosives and weapons on aircraft transporting (domestic and foreign inbound) passengers and their baggage as well as cargo containers/bays. Specific areas to be pursued are infrastructure protection, suicide bombers/leave behind improvised explosive devices, and vehicle bombs.

Radiological and Nuclear Countermeasures

Potential radiological and nuclear threats range from the deliberate dispersal of small amounts of radioactive material to the detonation of an improvised or stolen nuclear weapon to an attack on our nuclear power industry. Our Radiological and Nuclear Countermeasures portfolio provides the science and technology needed to reduce both the probability and the potential consequences of a radiological or nuclear attack on this nation's civilian population or our nuclear power facilities. Many of the on-going activities conducted in the Radiological/Nuclear Countermeasures Portfolio are being transferred in FY 2006 to the Domestic Nuclear Detection Office (DNDO). Those activities are indicated in the next section.

In FY 2004 and FY 2005, the Radiological/Nuclear Countermeasures portfolio:

- Formally assumed management of the Port Authority of New York and New Jersey radiation detection test bed from the Department of Energy in August, 2003. Following the transfer, the portfolio broadened the project scope beyond testing and evaluating individual pieces of technology to a systems approach, including response protocols and operational concepts. This program has been renamed the Countermeasures Test Bed to more accurately reflect that this program supports DHS's enduring operational testing and evaluation needs for all threat countermeasures technology, not just Radiological/Nuclear threats.
- Focused detection technology efforts on the detection of shielded special nuclear material (SNM) in cargo containers, based on the detection of both neutrons and delayed high-energy fission product gamma rays, and a portable neutron source, based on a mixed alpha-Be source in a switchable configuration for use in active interrogation; both currently are still in conceptual design and experiment phases.
- Preplanned product improvement efforts in this area were directed towards improvements in two current Customs and Border Protection-deployed radiographic imaging systems. This included software improvements and systems upgrades for local data integration, threat image projection (TIP), and assisted imaging processing (AIP).
- Incident management/recovery efforts include a joint DHS/HSARPA and DOD/DARPA (Department of Defense/Defense Advanced Research Projects Agency) project focusing on radiological and nuclear decontamination, consisting of four main tasks: (1) Radionuclide capture decontamination; (2) Wide area radionuclide decontamination; (3) Verification; and (4) Modeling.
- A major goal of FY 2005 is to establish a test and evaluation capability at the Nevada Test Site (NTS) for testing against SNM, and, as appropriate, to test and evaluate relevant FY 2005 prototype technologies developed in the portfolio's programs.

In FY 2006, the Radiological/Nuclear Countermeasure portfolio plans to:

- Redirect all detection related missions and corresponding funding to the establishment of the Domestic Nuclear Detection Office. The remaining, non-detection research and development will continue to be funded through the Radiological/Nuclear Countermeasures portfolio. The two programmatic thrust areas remaining are Incident Management and Recovery, and Attribution and Forensics on Contaminated Evidence (formerly part of the Systems Analysis and Pilot Deployments programmatic area).

- Complete the laboratory improvements that are necessary to carry out the attribution mission.
- Complete all field studies for the New York City Urban Dispersion Program with a technology transfer following to NYC Office of Emergency Management in late 2006.

Domestic Nuclear Detection Office

The risk that terrorists will acquire and use a Nuclear/Radiological device is one of the gravest threats that confronts the Nation. Acquiring nuclear weapons and materials is the hardest step for terrorists to take, and the easiest for us to stop. By contrast, every subsequent step in the process becomes easier for the terrorists, and harder for us to stop. Our defensive posture must begin with eliminating excess stocks of nuclear material and weapons throughout the world, protecting existing stocks from theft or diversion, and detecting illicit movement of nuclear/radiological material overseas before it reaches our borders. However, recognizing that even the best efforts to secure weapons and fissile material may not achieve 100 percent success, we must supplement these efforts abroad with a stronger layer of protection at home.

We must move swiftly to deploy a well-integrated system of detectors for nuclear/radiological materials and improve this system over time. While such a system will never be foolproof, it can dramatically improve the probability that we could detect illicit nuclear or radiological materials being brought covertly into position for use by an adversary. The gravity of the risk demands the focused, aggressive program envisioned here, with its mutually supportive elements of deploying and knitting together current technology so as to exact the greatest possible protection for our population while working continuously to improve that technology over time.

Since 9/11, many agencies have expanded their activities and operations to help build the domestic layers of the Nation's defense against nuclear terrorism. To optimize and advance these efforts, a new national-level, jointly staffed Domestic Nuclear Detection Office (DNDO) is being created to coordinate and extend the efforts in nuclear/radiological detection. This office will consolidate functions within DHS and establish strong linkages across the interagency for the deployment of a national domestic nuclear detection architecture, the conduct of transformational research and development (R&D), and the establishment of protocols and training for the end users of equipment developed and deployed through the new office. The office will further serve as the primary entity to

- Further develop, acquire, and support the deployment of an enhanced domestic system to detect and report on any attempt to import, possess, store, transport, develop, or use an unauthorized nuclear explosive device, fissile material, or radiological material in the United States;
- Enhance and coordinate the nuclear detection efforts of Federal, State, and local governments and the private sector to ensure a managed, coordinated response;
- Jointly establish and coordinate additional protocols and procedures for domestic use to ensure that the detection of unauthorized nuclear explosive devices, fissile material, or radiological material is promptly reported to the Attorney General, the Director of the Federal Bureau of Investigation (FBI), the Secretary of Defense, the Secretary of Homeland Security, the Secretary of Energy, and other appropriate officials or their designees for appropriate action by law enforcement, military, emergency response, or other authorities;
- Jointly develop and coordinate an enhanced global nuclear detection architecture with the following implementation: (i) the DNDO will be responsible for the implementation of the domestic portion of the global architecture, (ii) the Secretary of Defense will retain responsibility for implementation of DOD requirements, and (iii) the Secretaries of Defense, Energy, and State will maintain their respective responsibilities for policy guidance and implementation of the overseas portion of the global architecture, which will be implemented consistent with applicable law and relevant international conditions;
- Conduct, support, coordinate, and encourage an aggressive, expedited, evolutionary, and transformational program of research and development efforts to support the policy;
- Support and enhance the effective sharing and use of appropriate information generated by the intelligence community, law enforcement agencies, counterterrorism community, other government agencies, and foreign governments as well as provide information to these entities; and

- Further enhance and maintain continuous awareness by analyzing information from all DNDO mission-related detection systems.

Building upon the redirected base funding of $113 million for detection related RDT&E in the Radiological/Nuclear Countermeasures Portfolio, the FY 2006 request includes an additional $105.0 million to support the DNDO's mission and objectives (plus the $9 million requested increase for the Radiological/Nuclear Countermeasures Test and Evaluation Complex (Rad/NUc CTEC) discussed later in the FY 2006 Science and Technology Directorate Initiatives section.

Although the DNDO is principally focused on domestic detection, its coordinating work will enhance U.S. efforts overseas through the design of a global architecture implemented under current agency responsibilities. The new investments will speed the development and improvement of equipment and protocols, much of which will be applicable overseas.

Because multiple agencies share the resources or expertise necessary for the success of the office, the DNDO will be located within the Department of Homeland Security (DHS), but will be jointly staffed with representatives from DHS, the Department of Energy (DOE), the Department of Defense (DOD), and the Federal Bureau of Investigation (FBI), with coordination between the Department of Justice (DOJ), the Department of State (DOS), the Intelligence Community (IC), and other departments as needed.

The DNDO mission will be carried out through an organization that includes a Director supported by five major offices: Systems Engineering and Planning, Systems Development and Acquisition, Assessments, Joint Center for Global Connectivity, and Transformational Research & Development. These offices would be staffed jointly by appropriate agencies.

In FY 2006, the Domestic Nuclear Detection Office plans to:

- Develop the system architecture, conduct all associated systems engineering, develop technology roadmaps, and develop a strategic plan for the DNDO.
- Define the domestic nuclear detection architecture.
- Conduct research and development in support of the DNDO mission.
- Coordinate with other federal, State, and local R&D organizations.
- Develop concepts for innovative technologies and coordinate with interagency R&D organizations on all advanced detection technologies, development concepts, and programs.
- Develop and provide technical standards and protocols for detection systems, reporting systems, and information sharing systems.
- Design and conduct technical and operational test and evaluation of related detection equipment, technologies, systems, procedures, concepts of operation, and protocols for the domestic nuclear detection system.
- Prepare and maintain the DNDO Test and Evaluation Master Plan.
- Oversee the Radiological and Nuclear Countermeasures Test and Evaluation Complex (Rad/NucCTEC) and use other Rad/Nuc test infrastructure as needed to execute the Office's assessment responsibilities.
- Provide operational support, to include: (1) information collection, coordination, and analysis; (2) coordinated technical reachback; and (3) and the development of standards, protocols, concepts of operations, training, safety and security procedures, and State and local support.
- Identify technology opportunities and execute programs to dramatically improve the domestic nuclear detection system overall and component-wise performance, especially high-risk, high-payoff technology investments.

Threat and Vulnerability, Testing and Assessment

Our Threat and Vulnerability, Testing and Assessment (TVTA) portfolio is designed to develop, test, and deliver—in collaboration with intelligence, law enforcement, and homeland security community agencies—tools and methodologies for assessing terrorist threats and understanding terrorism. The TVTA portfolio focuses on the following five areas:

- Threat Assessment: Create and establish coherent capabilities for analysis, dissemination, visualization, insight, synthesis, and enhancement of terrorism-related information.
- Data Sharing: Enable tactical and strategic sharing of terrorism-related intelligence, information, and data among all elements of the homeland security community.

- Forecasting: Identify, understand, and forecast terrorist motives, intentions, behaviors, capabilities, processes, and tactics; understand individual and societal resilience to terrorism.
- Scalable Analyses: Enable scalable, integrated simulation and information analyses for threat identification and assessment; develop innovative computational technologies for deployment in next-generation knowledge management and threat assessment tools.
- System Optimization: Create optimized knowledge system designs and architectures that enhance the Nation's countermeasures.

This portfolio provides the science and technology needed to develop methods and tools to test and assess threats and vulnerabilities to protect critical infrastructure and enhance information exchange; this portfolio also includes a Biometrics Program.

In FY 2004 and FY 2005, the TVTA Countermeasures portfolio:

- Delivered two operational components, the Threat Vulnerability Integration System (TVIS) and the Threat-Vulnerability Mapper (TVM), to the Information Analysis and Infrastructure Protection (IAIP) Directorate. The TVM provides counterterrorism analysts with a simple, straightforward way to depict the geographic distribution of threats across the U.S. and to search the underlying databases for information on terrorists and attacks. TVIS integrates high-volume information analysis capabilities with specialized visualization tools that enable analysts to process large amounts of disparate intelligence data.
- Created the knowledge management architecture, known as ADVISE (Analysis, Dissemination, Visualization, Insight, and Semantic Enhancement) to integrate the various information analysis and synthesis, visualization, and knowledge discovery component capabilities. ADVISE will incorporate a comprehensive encyclopedia of chemical, biological, radiological, nuclear and explosive (CBRNE) threat and effects data. Pilot ADVISE systems for the BTS Directorate will be installed in FY 2005. Update the initial TVIS system at the Biodefense Knowledge Center with the enhanced ADVISE capability.
- Created the Interagency Center for Applied Homeland Security Technology (ICAHST) capable of addressing the technical needs of the Department and other members of the Homeland Security community. The center and its interconnected laboratories provides detailed technical information and guides research, strategy, and systems design for the broad range of technologies and techniques necessary to identify, understand, and remediate CBRNE threats.
- Completed an initial set of 120 all-CBRNE capability assessments for 20 terrorist organizations on the five CBRNE plus cyber threat agents. Continued support to the Nuclear Assessment Program (NAP) that judges the credibility of communicated nuclear threats for such clients as the FBI, DOE, and Department of State (DOS). In FY 2005, continue to produce all-CBRNE capability assessments. An additional 20 terrorist groups' capabilities and intentions will be analyzed using information from the intelligence community.
- Continued to implement the capability to analyze terrorist threats and stimulate analytical insight using visualization tools and techniques in FY 2005. The National Visualization and Analytics Center (NVAC), established in FY 2004, will produce a national agenda for visual analytics with broad input and support from the government, national laboratories and universities. The four NVAC core functions include research and development, education, technology evaluation and implementation, integration and coordination. Three Regional Visual Analytics Centers (RVACs) will also be established, to implement the visualization agenda on a regional scale. The RVACs will incorporate university research activities as well as commercial and other government visual analytics research into the national lab-oriented work of the NVAC.
- Established an integrated, national capability, called the Institute for Discrete Sciences (IDS), to investigate and develop the specialized computing algorithms and hardware architectures necessary to analyze massive amounts of diverse data from multiple, disparate, distributed data sources, and to model terrorist attacks and simulate consequences on a real-time, high-resolution basis. Like the NVAC, the IDS will have broad interaction and support from the government, national laboratories and universities.
- Completed an engineering design for the Enhanced International Travel Security (EITS) system, initiated in FY 2004, which will enable several pilots to

be implemented with the United Kingdom, Canada, and Australia. EITS allows the validity of travel documents and the identity of travelers to be determined in real-time at U.S. borders and other points of entry.

- Provided the science and technology needed in the development of biometrics for precise identification of individuals, and develop prototype instrumentation to aid authorized officials in detecting individuals with potentially hostile intent.
- Enabled a comprehensive capability for determining terrorist motivations, based on social, behavioral, and economic factors. Integrate this with techniques for determining terrorist or hostile intent as well as detecting deception.

In FY 2006, the Threat and Vulnerability, Testing and Assessment portfolio plans to:

- Enable the development of analytic resources and technologies to characterize terrorist capabilities, detect their activities, predict their intentions based on infrastructure vulnerabilities, strengthen preventive measures, and increase the ability to respond.
- Provide an enhanced, integrated capability for information synthesis, relying on a foundation of advanced semantic processing and visual analytics and supported by specialized discrete mathematics techniques and technology. This will provide comprehensive knowledge discovery and dissemination capabilities to a diverse set of users—from first responders to intelligence analysts.
- Develop a capability for information extraction, pattern discovery, group detection, and visualization for unstructured text as well as audio and video information to complement the existing capability for structured data.
- Continue expanding the roles of the NVAC and IDS by providing integrated capabilities to multiple DHS components, setting national agendas in visual analytics and discrete sciences, and furthering interagency cooperation.
- Create a National Homeland Security Support System (NH3S) using the ADVISE architecture and providing quantitative risk analysis and decision support capabilities.
- Create a CBRNE threat encyclopedia and integrate with the ADVISE (Analysis, Dissemination, Visualization, Insight, and Semantic Enhancement) system. Create a National Homeland Security Support System (NH3S) using the ADVISE architecture and providing quantitative risk analysis and decision support capabilities.

Standards Program

Ensuring that standards are created and adopted is critically important for homeland security. We need consistent and verifiable measures of effectiveness in terms of basic functionality, appropriateness and adequacy for the task, inter-operability, efficiency, and sustainability. Standards will improve the quality and usefulness of homeland security systems and technologies. Our Standards Program cuts across all aspects of the S&T Directorate's mission and all threats to improve effectiveness, efficiency, and inter-operability of the systems and technologies developed.

Our Standards Program continues to actively engage the federal, State, and local first responders to ensure that developed standards are effective in detection, prevention, response, management, and attribution. This program office also conducts the essential activities in order to meet the requirement of the SAFETY (Support Anti-Terrorism by Fostering Effective Technologies) Act in developing certification standards for technologies related to homeland security.

In FY 2004 and FY 2005, the Standards Program:

- Composed three management directives to establish DHS policy with regards to the adoption and development of national standards.
- Formed an interagency task force to address the controversy over the effectiveness and use of lateral flow immunoassays for the detection of *Bacillus anthracis* (anthrax) by emergency responders.
- Evaluated a five step method to pre-screen suspicious white powders through an effort with Edgewood Chemical Biological Center (ECBC) and an additional effort with the National Institute of Standards and Technology (NIST) to look at the effectiveness of biological agent simulants, and the establishment of a program to address both chemical and biological decontamination standards for the first responder community.

- Supported efforts with American Society for Testing and Materials (ASTM) to coordinate the development of a draft standard for hospital preparedness and to develop a multi-disciplinary Mission Essential Task List (METL) based on Emergency Responder Guidelines developed by the Office of Domestic Preparedness.
- Within Standards for Personal Protective and Operational equipment, the program supported the development of a number of respiratory standards including three National Institute for Occupation Safety and Health (NIOSH) standards and one National Fire Protection Association (NFPA) standard adopted by DHS in February 2004.

In FY 2006, the Standards Program plans to:

- Continue to maintain and improve the process by which homeland security standards are developed and promulgated at the federal level. Incorporate the appropriate conformity assessment program development into the standards development process. Maintain and update the homeland security standards database available to the homeland security community.
- Continue to utilize interagency working groups to re-evaluate requirements and prioritize needs for CBRNE countermeasures standards. Focus on developing sampling protocols and guidelines and standardized sample triage methods for CBRNE countermeasures. Focus on standards for emerging CBRNE countermeasures technologies including CBRNE point detectors; CBRNE stand off detectors and urban surveillance technologies such as BioWatch, CBRNE facility monitors, and water distribution monitors. Continue programs to address multimodal biometrics, latent fingerprints, rapid biometric evaluations, and biometric image and feature quality. Also explore and evaluate ergonomics, human factors, and usability issues of biometric sensors, software, and systems.
- Continue with the completion of a standard guide for building event dispersion and health assessment preparedness and response planning and the standard guide for conducting emergency preparedness drills and exercises.
- Continue current CBRNE personal protective and operational equipment specifically focusing on completing the suite of respiratory protection equipment standards to include powered air purifying respirators, closed-circuit self contained breathing apparatus, supplied air respirators and combination respirators.

Support to Department of Homeland Security Components

As I have mentioned, the operational components of the Department are my customers.

To ensure we meet customer needs, the S&T Directorate has established the Science and Technology Requirements Council (SRC) to bring forward a set of vetted needs from the entire Department. This is an Assistant Secretary level committee with representation from across DHS that has been chartered to assist in the solicitation, validation, and prioritization of all science and technology requirements. This council is intended to help the S&T Directorate identify those needs most crucial to the DHS mission and to develop the most effective S&T program possible using existing resources. As part of their mission, the SRC reviews DHS operational requirements and needed capabilities that require S&T solutions, and identifies those opportunities that have cross-cutting technology solutions. Prioritized Departmental needs are then presented to me as a recommendation for consideration, in conjunction with all externally derived S&T requirements (e.g., statutory, national guidance), for inclusion in the S&T Directorate's Planning, Programming, and Budgeting Cycle Guidance.

The inaugural meeting of the SRC took place September 30, 2004, and was attended by representatives from Border and Transportation Security (BTS), Emergency Preparedness and Response (EP&R), Information Analysis and Infrastructure Protection (IAIP), the Office of Domestic Preparedness (ODP), U.S. Citizenship and Immigration Service (CIS), U.S. Coast Guard (USCG) and U.S. Secret Service (USSS). Our initial meeting resulted in new requirements and a validation of the needs that our portfolios had already identified through their interactions with the rest of the Department. It further served to bring together the many disparate groups from across DHS and facilitated a new dialogue that will be necessary to produce a successful S&T RDT&E program. The input we received at the September 30, 2004, meeting was used to adjust the FY 2006 budget request and is currently being integrated into our FY 2007–2011 Planning, Programming and Budgeting cycle.

I will now address the specific programs being conducted by our mission support portfolios.

Support to Border and Transportation Security

The Science and Technology Directorate supports all elements of BTS enforcement and facilitation processes through identifying operational requirements, developing mission capabilities-based technological needs, and implementing a strategic plan. We are providing systems engineering support to various BTS programs including US VISIT and Unmanned Aerial Vehicles.

The Science and Technology Directorate's support to the BTS Directorate is accomplished by implementing a capabilities-based technology planning process. The capabilities-based approach establishes the scope of effort and framework for a technology plan. Through a series of user conferences and technology opportunity conferences, requirements are developed and prioritized for new and improved capabilities. Operational personnel identify capabilities and technology personnel identify potential development opportunities. Capability gaps and possible technology solutions are proposed, and a budget is developed to distinguish between both funded and unfunded needs.

The Science & Technology Directorate, in collaboration with BTS, co-chairs the Department's Unmanned Aerial Vehicle (UAV) Working Group. This group is currently focused on developing the Border and Transportation Security operational requirements for UAVs and related technologies, e.g., aerostats, blimps, lighter than air (LTA) ships, and fixed and mobile towers. The UAV Working Group has identified the following six BTS capability objectives that could benefit from the utilization of UAVs:

- surveillance and monitoring
- communications
- apprehension
- targeting
- intelligence
- deterrence
- officer safety

Based on these high-level requirements, the Science and Technology Directorate is developing concepts of operations and assumptions that will be used in conducting an Analysis of Alternatives that will include UAVs as well as other technologies.

- Over the past two years, the Science & Technology Directorate has sponsored two major evaluations of Unmanned Aerial Vehicle (UAV) technology as part of the Arizona Border Control Initiative.

In FY 2004 and FY 2005, the Border and Transportation Security R&D portfolio:

- Issued a solicitation for an Advanced Container Security Device to develop and field test (within the Directorate's CounterMeasures Test Bed) the next generation of shipping container security devices, building on the current efforts through Operation Safe Commerce as well as current Border and Transportation Security policy efforts to develop and implement performance requirements for container security. The Advanced Container Security Device program is part of a "Future Smart Container" initiative encompassing container security, communications, and data systems for the future.
- Supported the BTS Directorate in putting technology in the field to support the Arizona Border Control Initiative. The portfolio demonstrated other technologies such as a long-range acoustic device that allows agents to communicate from a safer standoff distance to determine the intent of people.
- Continued development and refinement of BTS technology requirements and planning. Using a capabilities-based process, the portfolio's goal was to ensure that federal technology planners understood the capabilities that BTS agents and officers view as essential for mission success and to help planners focus technology development on filling the identified gaps in those capabilities.
- Developed the BTS Technology Vision which include Border Watch, Transportation Watch and Border Net which significantly improves our ability to provide the information necessary to secure our borders. The foundation of the vision is an architecture and a set of technology programs that will gather, process and distribute real-time knowledge of the border and transportation situation and provide decision support tools and labor saving devices for our security forces.

In FY 2006, the Border and Transportation Security R&D portfolio plans to:

- Build on the sensor trade studies and modeling conducted in FY 2005 to develop and test advanced sensor suites including improved visual and non-visual sensors (video, infrared, seismic, acoustic and radar). These sensors may be deployed on the ground, at sea, and in the air. In addition, evaluate data produced by Ports-of-Entry (POE) inspectors, such as traffic and incident information, along with data produced by border inspection systems will be evaluated as part of the surveillance system.
- Build on the design and development effort accomplished in FY 2005 on the next generation of container security and communications systems to detect intrusion, location, contents and tampering. The requirements for this system include recording and reporting location; detection of intrusion and communication of log history, and sensor and inspection data.
- Integrate Transportation Watch capabilities across the transportation domains enabling a Common Operational Picture (COP) across the entire transportation environment. Extensive data sharing, including the ability to discover links in criminal or suspicious activities across domains will be a key requirement to providing an effective Transportation COP.
- Initiate development and integration of smart portals and sensors for detection of explosive threats to shipping. Utilize rapid prototyping processes, focusing initially on passenger and vehicle ferries.
- Define system architecture that fully supports the Border Watch Common Operational Picture with multi-modal access to essential databases, remote communications and intelligence fusion.

Support to Emergency Preparedness and Response

The S&T Directorate's Emergency Preparedness and Response (EP&R) portfolio supports the Department's EP&R Directorate with a mission to improve the ability of the Nation to prepare for, respond to, and recover from all-hazards emergencies through development and deployment of enabling capabilities. Particular emphasis is placed on technology integration at all levels of government, detection and monitoring systems for chemical, biological, radiological, nuclear and explosive (CBRNE) threats, and long-term sustained performance and inter-operability enhancement of State and local preparedness. The most important customers of EP&R technologies are the federal, State and local emergency responders and emergency managers who are first into an emergency zone and often last to leave. Specific objectives of the portfolio are to:

- Identify and develop relevant technology solutions through partnerships with operational end-users;
- Integrate advance all-hazards technology into federal, State, and local emergency response infrastructures; and
- Provide scientific and technology leadership for implementation of HSPD–5 (Management of Domestic Incidents) and HSPD–8 (National Preparedness) efforts.

In FY 2004 and FY 2005, the Emergency Preparedness and Response R&D portfolio:

- Initiated operation of the Interagency Modeling and Atmospheric Assessment Center (IMAAC) and supported the National Exercise Program and special events, such as the Democratic and Republican National Conventions. IMAAC established connectivity to the Department of Homeland Security Operations Center and the FEMA National Emergency Operations Center to provide near real time hazards predictions for airborne releases.
- Selected four urban areas for the pilot of the Regional Technology Integration (RTI) Initiative. These locations provide an opportunity to evaluate geographic and governance diversity as well as variability in threats and vulnerabilities. Initiated an integrated assessment process in collaboration with these communities.
- Focused activities on the identification of simulation based training and education requirements through interaction with the responder community. The portfolio leveraged the work initiated by Office of Domestic Preparedness and the Memorial Institute for the Prevention of Terrorism, the National Institute of Justice and the Department of Defense in identifying needs and gaps as well as existing technology development programs that can be utilized for incident management training

In FY 2006, the Emergency Preparedness and Response R&D portfolio plans to:

- Leverage federal resources to provide dynamic venue for collaborative research, development, testing and evaluation of atmospheric transport and dispersion (ATD) models for hazards predictions. IMAAC will host researchers from throughout the Nation at its facility as well as participate in virtual collaboration both nationally and internationally.
- Complete implementation of technology systems solutions for the first four pilot locations of the RTI initiative; prepare test and evaluation plans and conduct operational readiness exercises to evaluate the overall system performance.
- Develop the system requirements that support national, inter-operable simulation based training and exercise. This capability will focus on large scale, multi-jurisdictional incidents and will facilitate the implementation of the National Incident Management System and the National Preparedness Goal.
- Demonstrate several revolutionary and highly innovative materials for emergency personal protective equipment (PPE) applications. Demonstrate prototype material/technologies that can that can be made into functional garments and/or integrated personal protective systems will be demonstrated.
- Initiate an Advanced Concept Technology Demonstration of a candidate Unified Incident Command (UIC) architecture that will achieve revolutionary advances in Unified Incident Command and Decision Support and bring analytical tools to bear on real-time information in-flows and out-flows for incident commanders and emergency responders. Advanced capability will be applicable to a variety of response paradigms, including single incidents, multiple simultaneous incidents, long duration response and recovery operations, and large-scale public health events.

Support to United States Coast Guard

The mission of the United States Coast Guard (USCG) R&D portfolio is to develop technology and systems to provide the capability to safeguard lives, property and environment from intentional and accidental maritime threats and protect maritime mobility through the free flow of goods and people while maximizing the recreational use of the Nation's waterways.

The USCG R&D portfolio covers the Homeland Security (HLS) and Non-HLS missions performed by Coast Guard operational forces. HLS priorities include research programs that address a defense in depth, or layered approach, to Maritime Domain Awareness, Prevention/Protection, Response and the management, analysis and distribution of information, (e.g., Sea Guardian, Coastal Shield, Port Protector and Smart Commander). Similarly, USCG non-HLS mission research needs (e.g., Search & Rescue, Maritime Oil Spill Response, Aquatic Nuisance Species, Waterways Navigation, etc.) are addressed through programs like Safe Voyage, Clean Sweep, ANS Eradicator and Able Navigator. Together these programs support the five Strategic Goals of the USCG (Maritime Safety, Protection of Natural Resources, Maritime Security, National Defense, and Maritime Mobility).

The USCG portfolio expects in FY 2006 to see the continuation of HLS mission research in the following areas:

- Situational Awareness for Maritime Domain Awareness—develop automated classification and prediction capability for vessel intent with a port area.
- Compel Compliance—field new capability to communicate and stop at-sea small prop-driven vessels and in port swimmers/divers.
- Boarding Capability—improve space accountability for non-ferrous vessels.
- Personnel Alerting and Contraband Detection and Identification—adapt breakthrough. Technologies in CBRNE countermeasures for the maritime environment.

For non-HLS mission support, this portfolio will continue to place its highest priorities on high-risk, high-reward research and development relevant to the Coast Guard's traditional mission set that might not otherwise be addressed in order to enhance operational components within the Coast Guard. Non-HLS mission support will address Coast Guard Strategic Goals (i.e., Maritime Safety, Security and Mobility, and Protection of Natural Resources) through RDT&E efforts that will provide increased knowledge, capability and performance improvements in the following areas:

- *Aquatic Nuisance Species Eradication:* non-invasive treatment of ballast water;

- *Oil Spill Detection & Response:* fielding of new technology, equipment and devices to detect subsurface and submerged *(heavy)* oils from standoff distances;
- *Rapid Hazardous Material (HAZMAT) Response Information:* evaluate airborne detection capability for heavy oil spills and identify Commercial-off-the-Shelf (COTS) technologies for HAZMAT identification by USCG inspection personnel; and
- *Search & Rescue:* incorporate environmental/meteorological data into CODAR improving current analysis and short-term forecasting for target movement and search area predictions; develop improved Last Known Position estimators in support of USCG Search Area Planners resulting in reduced search areas and increasing survivability of persons lost at sea.

Support to the United States Secret Service

The mission of the United States Secret Service (USSS) portfolio of the S&T Directorate is intended to support the unique USSS mission by development and deployment of advanced technologies to enhance protective and investigative capabilities. This portfolio is coordinated with the United States Secret Service and has established its first direct-funded R&D program. The USSS portfolio effort focuses upon input from the intelligence community (threat based model) and direct operational experience obtained over the last century. As a result, this funded technology program is subject to re-evaluation and change based upon the perceived threats to the safety of those protected by the USSS.

In 2004, the portfolio addressed four projects/programs. The Emerging Threats Program supports the Secret Service's continuing, comprehensive assessments of emerging threats and evolving technologies that pose a threat to dignitaries and assets protected by USSS personnel. The Law Enforcement Virtual-Reality Training Model program supports prototyping and deployment of a law enforcement security-oriented simulation training system for the USSS-specific training and modeling. Additionally, this system will enhance the effectiveness of emergency responders during actual events. The Critical Structure Protective Initiative (CSPI) program will ensure continued research and development of network protection systems and procedures designed to mitigate exploitation of site-specific "Very Large Scale Integration" (VLSI) control architectures. The Wireless Tracking Device program supports development of a handheld, man-portable wireless tracking device for locating operators of wireless communication device(s) in difficult radio frequency environments such as an office building or event stadium.

In FY 2006, the U.S. Secret Service Portfolio plans to continue development of appropriate escape hood technology, begin the development of a mobile platform that will be required to detect, exploit, and defend against covert and overt electronic surveillance systems, continue (given a successful proof of concept in FY 2005) with the development of a ubiquitous mobile computing system that would allow secure wireless networked communication between unlike devices with high fidelity data transmission; and initiate an Optical & Chemical Tagging/Tracking Project under this program. This project's objective will be the development of optical and chemical tags that are robust and covertly deployable.

Homeland Security University and Fellowship Programs

In this portfolio we seek to develop a broad research capability within the Nation's universities to address scientific and technological issues related to homeland security. The portfolio places a high priority on developing academic programs and supporting students in order to build learning and research environments in key areas of Departmental interest.

In FY 2004, the Homeland Security University Programs established three Centers of Excellence:

- The Center for Risk and Economic Analysis of Terrorism Events, at the University of Southern California and its partners will receive $12 million over three years to evaluate the risks, costs and consequences of terrorism and to guide economically viable investments in countermeasures.
- The National Center for Foreign Animal and Zoonotic Disease Defense at Texas A&M and its partners will receive $18 million over three years to address potential threats to animal agriculture including Foot and Mouth Disease, Rift Valley fever, Avian influenza and Brucellosis. In addition to working closely with industry and government, they will work with DHS's Plum Island Animal Disease Center.
- The National Center for Food Protection and Defense at the University of Minnesota and its partners will receive $15 million over three years to estab-

lish best practices and attract new researchers to manage and respond to food contamination events, both intentional and naturally occurring.

In FY 2005, DHS announced the selection of the University of Maryland (UMD) and its partners as the Center for Behavioral and Social Research on Terrorism and Counter-Terrorism. This Center will be funded at $12 million for three years following contract award

During late FY 2005 and early FY 2006, the S&T Directorate expects to establish at least three additional Centers of Excellence. Each Center is awarded an initial three-year grant whose annual cost we account for in our planning.

As part of the Department's mission to maximize collaboration with other federal agencies, University Programs and EPA's Science to Achieve Results (STAR) Program have collaborated on the topic of microbial risk assessment. The DHS–EPA cooperative Center on Microbial Risk Assessment will result in one five-year grant to a university-based consortium will be jointly funded by both agencies for a total of $10 million.

Last fall, University Programs selected approximately100 students for the 2004 class of DHS Scholars and Fellows bringing the total of students to about 200. Students from the 2003 and 2004 class participated in a DHS orientation for the purpose of learning about DHS mission objectives, the critical research needs, and meeting scientists from DHS laboratories, Centers of Excellence and DOE national laboratories. Students from both classes are attending 93 institutions (including Historically Black Colleges and Universities/Minority Serving Institutions) in 38 states and the District of Columbia. Seventeen of the institutions are located in Experimental Program to Stimulate Competitive Research (EPSCoR) states. Besides making immediate contributions to homeland security-related R&D, these students will be part of the development of a broad research capability within the Nation's universities to address scientific and technological issues related to homeland security.

Beginning in FY 2006, the steady state of up to 300 highly talented and diverse students will be maintained.

Emerging Threats

It is truly the threats we do not yet know that are often the most terrifying. Our Emerging Threats portfolio addresses the dynamic nature of terrorist threats, as science and technology advancements enable new agents of harm and new ways to employ them. This portfolio places high priority on developing the capability to use innovative, crosscutting, out-of-the-box approaches for anticipating and responding to new and emerging threats. Successful identification of emerging threats will permit capabilities to be developed to thwart these emerging threats before they are used.

Relevant R&D is underway at other agencies and organizations; thus, partnerships in this area hold great potential for synergistic focus on homeland security. Work is being done and will continue to be pursued in partnership with the Departments of Energy, Defense, Justice, and Agriculture, the intelligence community, and the National Institutes of Health.

In FY 2004 and 2005, the Emerging Threats portfolio:

- Established informal partnerships with the intelligence community and with the USSS portfolio to leverage ongoing activities in support of over-the-horizon assessment.
- Initiated efforts, in combination with Rapid Prototyping, in both near-term and breakthrough solutions to homeland security issues. Near-term projects are funded out of the Rapid Prototyping Portfolio. Breakthrough projects are funded from the Emerging Threats Portfolio.
- Held a privacy protection workshop in which the technical and policy communities interacted to identify important technical challenges and high impact solution areas. Information from this workshop will form the basis of upcoming programs in this area.
- Analyzed multiple radar technologies and other surveillance strategies to determine which combination of technologies would best support coastal surveillance by the USCG.
- Conducted three sensitive projects, two in collaboration with the USSS and one addressing a critical infrastructure.
- Sponsored studies at the Homeland Security Institute to identify threat and technology trends and develop a framework for analyzing emerging and future threats to homeland security.

In FY 2006, the Emerging Threats portfolio plans to:

- Sponsor comprehensive assessments to identify and prioritize emerging threats. The outcomes of the assessments lead the strategic programs to integrate multiple disciplines and threat scenarios and comprehensively use intelligence-based information to establish organizational foresight.
- Fund research dedicated to long-term, undefined threats as a means to exercise technology influence in the marketplace and build infrastructure to incentivize non-requirements driven, high-risk, high-payoff R&D, thereby promoting technology push and collaboration to solve otherwise intractable problems.
- Complete development of projects initiated in FY 2005, and test and evaluate the products from these projects. Develop technologies and systems against emerging threats identified as a result of FY 2005 emerging threats analysis.

Rapid Prototyping

By accelerating the time needed to develop and commercialize relevant technologies, the Science and Technology Directorate will ensure that operational end-users will be better able to prevent terrorist attacks, reduce the Nation's vulnerability, and minimize the damage and assist in recovery if attacks occur. Our Rapid Prototyping portfolio advances the Directorate's mission to conduct, stimulate and enable RDT&E and timely transition of homeland security capabilities to federal, State and local operational end-users.

In FY 2004 and FY 2005, the Rapid Prototyping portfolio:

- Solicited ideas, concepts and technologies for 50 requirement areas of interest to both the Department and other agencies. Initiated efforts to address chemical and biological threats, explosive detection, training technology tools, improvised nuclear device defeat, and investigative and forensic support topics.
- Developed a joint port and coastal surveillance prototype designated HAWKEYE with the United States Coast Guard (USCG) that provides an integrated maritime surveillance system covering Port Everglades, Miami, and Key West, Florida. This first-of-its-kind integrated command center and maritime surveillance facility opened in July 2004.
- Initiated the implementation of the Technology Clearinghouse as required in the Homeland Security Act of 2002. This clearinghouse serves as the central nexus to the public safety and first responder community on: (1) Information services supporting access to, and dissemination of, information regarding innovative technologies serving the DHS mission; (2) Resources designed to support the collaborative needs of teams serving the mission of DHS; and (3) Technology programs and resources themselves, designed to serve the mission of DHS and distributed via a central DHS mechanism.

In FY 2006, the Rapid Prototyping portfolio plans to:

- Transition mature programs from the development phase to operational testing and evaluation programs and commercial or government entities for deployment. Identify new technology candidates and capabilities to meet the existing and emergent technical requirements of the Department.
- Continue support of the Technology Clearinghouse in FY 2006 and continue to fund projects initiated under the Near Term and Future Technologies solicitation released in FY 2004.
- Complete the development of projects, within the Support to State and Local Responders project, initiated in FY 2005, and test and evaluate the products from these projects.

Counter–MANPADS

The Counter–MANPADS program is focused on demonstrating the viability, economic costs, and effectiveness of adapting existing military technology to protect commercial aircraft from the threat of Man Portable Air Defense Systems (MANPADS). The major thrust of this program is to demonstrate and evaluate the possible migration of existing technologies to the commercial airline industry, not to develop new technologies. The resulting countermeasure systems must have minimal impact on air carrier and airport operations, maintenance, and support activities. The re-engineering of existing countermeasure technologies and components is necessary to meet commercial air carrier operation requirements, including protection of critical military technology. The program balances cost, schedule, and performance with the needs and requirements of the aviation community stakeholders.

Upon completion of a two-phase analysis, prototype and testing program, DHS will provide the Administration and Congress with a recommendation for the most viable solution to defend against shoulder-fired missiles.

To mature the reliability of the underlying military technology to commercial standards, validate system effectiveness and suitability in an operational environment, and to develop and implement a comprehensive approach to technology protection, a follow-on Phase III has been planned. Phase III will include delivery and installation of pre-production Counter–MANPADS equipment on commercially operated aircraft by U.S. cargo carriers similar to those aircraft dedicated to meet Civil Reserve Air Fleet (CRAF) requirements. This will integrate a limited number of systems on multiple airframes in actual revenue service across the different carriers for the purpose of operational testing and evaluation, data collection, and the certification of a number of different aircraft types. Phase III remains subject to approval by the Administration and Congress.

In FY 2004 and FY 2005, the Counter–MANPADS program:

- Initiated and completed Phase I following a competitive bidding process. DHS awarded Other Transaction (OT) for Prototype Agreements (OTA) to three companies—BAE Systems, Northrop Grumman, and United Airlines—for Phase I of a two-year System Development and Demonstration (SD&D) effort. The contractors focused on proving the feasibility of migrating existing DOD technology into the commercial sector and exploring other technology as appropriate. Following Preliminary Design Reviews with all three companies in July 2004, the Phase I portion of the twenty-four month SD&D effort concluded and DHS initiated a selection evaluation process to determine which of the three companies would be selected to further mature their preliminary designs, build representative prototypes, install them on aircraft, and conduct formal testing during the Phase II eighteen month effort.
- Involved the stakeholder community beginning in FY 2004. In late 2004, the Program Office hosted a Stakeholders' Meeting, attended by representatives of the airlines, the equipment manufacturers, and other affected sectors, including representatives of multiple Federal Government Departments and Agencies.

In FY 2006, the Counter–MANPADS program plans to:

- Build, deliver, install, and fly pre-production Counter–MANPADS equipment on commercially-operated aircraft by U.S. cargo carriers similar to those aircraft used for the Civil Reserve Air Fleet (CRAF) operations.
- Conduct operational testing and evaluation and data collection on multiple aircraft types to capture operational and maintenance costs as well as technical performance and reliability data in a commercial operational environment.
- Modify Phase II systems to incorporate new design requirements including reliability, technology protection, and emergency ground notification improvements based on test and evaluation results.
- Examine maintaining two contractors in Phase III to foster competition, and to promote manufacturing should a full-rate decision be made.
- Conduct an aggressive reliability growth effort to increase system reliability to 3000 hours and reduce recurring support costs.
- During FY 2006, conduct Live-Fire Test and Evaluation assessment.
- Continue on-going dialogues with Original Equipment Manufacturers (OEM) such as Boeing and Airbus and conduct studies to scope the effort required to include provisions for Counter–MANPADS systems on future production aircraft.
- Pursue Federal Aviation Administration certification for additional aircraft types/models/series not addressed in Phase II.

Office of SAFETY Act Implementation

The mission of the Office of SAFETY Act Implementation (OSAI) is to evaluate technologies submitted to it by applicants in accordance with the criteria set forth in the Support Anti-terrorism by Fostering Effective Technologies Act of 2002 (SAFETY Act) and Interim Regulations. As part of the *Homeland Security Act of 2002,* Public Law 107–296, Congress enacted the SAFETY Act to provide "risk management" and "litigation management" protections for sellers of qualified anti-terrorism technologies. The purpose of the Act is to encourage the development and deployment of anti-terrorism technologies (ATT) that will substantially enhance the

protection of the Nation. Specifically, the SAFETY Act creates certain liability limitations for "claims arising out of, relating to, or resulting from an act of terrorism" where qualified anti-terrorism technologies have been deployed.

Although there are many technologies that are important to protecting our homeland, the SAFETY Act Designation and Certification are designed to support effective technologies aimed at preventing, detecting, identifying, or deterring acts of terrorism, or limiting the harm that such acts might otherwise cause, and which also meet other prescribed criteria.

OSAI evaluations are designed to generate advice to the Under Secretary on the appropriateness of granting protections under the SAFETY Act. In support of this mission, OSAI undertakes efforts to raise public awareness of the benefits of the protections available under the SAFETY Act. In addition, OSAI coordinates its process with other offices within DHS and other federal agencies to both support those offices in their missions and to minimize the burden on applicants for SAFETY Act protections.

The Department moved quickly to create OSAI. In July 2003, a notice of proposed rulemaking was published for comment, and on October 16, 2003, an interim rule was published with a request for public comments, thus implementing the program. Facilities to house the program were selected and OSAI has identified and entered into agreements with the lead implementation contractor and lead web site development/management contactor. OSAI designed and implemented a web-based application kit and process with an interactive help desk. OSAI executed a robust outreach program to introduce the industry to the SAFETY Act program and to encourage its participation. OSAI has received and has responded to 72 full applications and 166 pre-applications. Four applicants have been awarded SAFETY Act designation and certification: Northrop Grumman; Michael Stapleton Associates; Teledyne Brown Engineering; and Lockheed Martin.

The Office intends to refine its operations throughout FY 2005. OSAI, in consultation with the Department's Office of the General Counsel, has been revising the Interim Rule based on the comments received from the public and our experiences with applicants over the past year. OSAI will revise the application kit to make it clearer and more user-friendly, and will work to streamline the process based on lessons learned from the previous year. The number of applications is expected to increase significantly with the introduction of the revised kit, implementation of the Final Rule, and higher visibility.

In FY 2006, OSAI plans to expand its coordination of the program with pending federal, State, and local procurements. It also plans to work with recognized procurement organizations and appropriate industry associations to educate them on the availability of SAFETY Act protections to potential vendors.

Office of Inter-operability and Compatibility

The Office of Inter-operability and Compatibility (OIC), managed by the S&T Directorate, was tasked to lead the planning and implementation efforts in coordination with other DHS programs. It oversees the wide range of public safety inter-operability programs and efforts currently spread across Homeland Security. These programs address critical inter-operability issues relating to public safety and emergency response, including communications, equipment, training, and other areas as needs are identified.

Creating inter-operability requires coordination and partnerships among managers, partners, and stakeholders at all levels of government. OIC will establish partnerships with all relevant offices and agencies to ensure that the programs address all possible issues related to public safety inter-operability and compatibility. These partners and additional relevant stakeholders include representatives from the emergency response providers represented by their national associations, State and local government agencies, DHS and other Federal Government agencies, standards development organizations, and industry.

Since October 2004, the OIC has interviewed key stakeholders across federal and practitioner communities to validate findings, uncover additional inter-operability initiatives, and determine key issues for first response; identified a core group of federal programs that test and evaluate first responder equipment; began developing a plan to establish a Joint Evaluation and Testing Program to coordinate with other federal agencies; and conducted an initial scan of existing programs for first responders and collected information at the local, State, and federal levels.

Critical Infrastructure Protection Portfolio

The Science and Technology Directorate's Critical Infrastructure Protection (CIP) portfolio protects the Nation's critical infrastructure and key assets from acts of terrorism, natural disasters, or other emergencies by developing and deploying tools to

anticipate, identify and analyze risks, and systems to reduce those risks and the consequences of an event. The portfolio puts a focus on scientific prioritization of components of critical infrastructure and key resources/assets and partners with other organizations to catalyze development of critical infrastructure protection technologies.

In FY 2004 and FY 2005, the Critical Infrastructure Protection R&D portfolio:

- Developed a CIP Decision Support System (DSS) focused on prioritizing investment, protection, mitigation, response, and recovery strategies related to Critical Infrastructure Protection. The prototype model includes representation of all 14 critical infrastructure sectors, as outlined in the National Strategy for the Protection of Critical Infrastructures and Key Assets, as well as their interdependencies. Preliminary test cases have been used to develop consequence estimation features of the CIP–DSS at both national and metropolitan scales.
- Initiated a system study to find potential solutions for personnel surety for security guards that guard our nation's Critical Infrastructure, as well as insiders with access to sensitive areas of, or information about the infrastructure.
- Supported a System Study for Municipal Domestic Water Security, along with the Biological Countermeasures Portfolio, Chemical Countermeasures Portfolio, and Radiological/Nuclear Countermeasures Portfolio.
- Initiated interagency development of the first annual National Critical Infrastructure Protection R&D Plan using the Infrastructure Subcommittee of the National Science and Technology Council.
- Initiated cooperative and collaborative research and development project with the Kentucky Homeland Security University Consortium comprised of the University of Kentucky, the University of Louisville, Eastern Kentucky University, Western Kentucky University, Northern Kentucky University, Morehead State University, Murray State University, Kentucky State University and the Kentucky Community & Technical College System.

In FY 2006, the Critical Infrastructure Protection R&D portfolio plans to:

- Incorporate a fully parameterized metropolitan area modeling capability into the CIP–DSS. Integrate adversary-defender constraint and information dynamics models into CIP–DSS. Add an enhanced threat spectrum capability to CIP–DSS and complete pilot tests of the CIP–DSS in several State and regional areas.
- Publish the *National Academy Study on Security of the Electrical Industry.*
- Complete the quick-look system studies of all 14 Critical Infrastructures and Key Resources, and the end-to-end System Study for Municipal Domestic Water Security.
- Deliver improved closed circuit TV (CCTV) components for object identification and behavior recognition. Deliver an enhanced threat detection CCTV system based on video image understanding architecture, including the improved CCTV components.
- Deliver the second annual National CIP R&D Plan with agency budget information and a roadmap for deliverables. Incorporate relevant inputs from: a) federal agencies including activities, and levels of effort; b) critical infrastructure sector owners and operators; and c) private and public research institutions and universities.

Cyber Security R&D Portfolio

The Cyber Security R&D Portfolio supports the mission of the Information Analysis and Infrastructure Protection Directorate and is focused on leading cyber security research, development; testing and evaluation endeavors to secure the Nation's critical information infrastructure through coordinated efforts that will improve the security of the existing cyber infrastructure, and provide a foundation for a more secure infrastructure. This will be accomplished by focusing on R&D aimed at preventing, protecting against, detecting, responding to, and recovering from large-scale, high-impact cyber attacks, supporting the development and accelerating the deployment and use of more secure Internet communication protocols, addressing cyber security R&D needs that are unique to critical infrastructure sectors, and provide novel and next-generation secure information technology concepts and architectures.

In FY 2004 and FY 2005, the Cyber Security R&D portfolio:

- Initiated dialog aimed at international collaboration on cyber security R&D with Canada, the United Kingdom, and Japan. Interactions with the United Kingdom and Japan are at early stages and have not yet reached the point where potential joint R&D activities have been identified.
- Worked with federal researchers and officials and the private sector to develop a roadmap to accelerate the development and deployment of a secure domain name infrastructure. Current work also includes the identification of technology requirements and development of models to aid in assessing the performance impact of utilizing Domain Name System Security Extensions (DNSSEC) in operational environments.
- Initiated a program to address different facets of the need for improved methods for cyber security assessment and testing, in order to provide a foundation for the long-term goal of economically-informed risk-based cyber security decision-making.
- Provide technical support funding through the "virtual" Cyber Security R&D Center for the S&T Directorate in pre-research activities (such as developing roadmaps, organizing workshops and meetings, aiding in drafting research solicitations and proposal review), as well as post-research activities (such as facilitating pilot tests and exercises, venture capital community outreach, private sector outreach, and interfacing with non-government R&D communities).

In FY 2006, the Cyber Security portfolio plans to:

- Continue to provide support to the Directorate through the "virtual" Cyber Security R&D Center in pre-research activities and post-research activities. FY 2006 activities will have a significant focus on private sector and venture capital community outreach.
- Initiate a new two-year R&D program phase, again overlapping with the program started in FY 2005. As the FY 2004 program comes to a close in FY 2006, progress against the FY 2004 technical topic areas will be evaluated.
- Complete full-scale operational test bed, acquisition and generation of network data sets, enhancement of remote management and configuration capabilities, and a final project report.
- Focus on system-level DNSSEC implementation, with the development of software reference implementations for servers and client applications, and planning for pilot deployments of DNSSEC. Direct investments in the area of routing protocol security at the development of a modeling and simulation framework for impact assessment of secure routing protocols on the Internet performance.
- Focus on pursuing partnerships that allow broader non-government participation, accompanied by a greater role of non-government organizations and funding sharing responsibility for oversight and financial support for this capability.

R&D Consolidation

Funds originally requested by the U.S. Coast Guard to support operations, maintenance and salaries for the assigned science staff for the Coast Guard Research and Development Center will be integrated into the Science and Technology Directorate mission space to support the continued operations and scientific activities at the Coast Guard Research and Development Center. Funds originally requested by the Customs and Border Protection (CBP) to support salaries for those assigned to the Research, Development, and Evaluation Branch will likewise be integrated into the S&T Directorate mission

In FY 2006, DHS's Science and Technology Directorate will unite the RDT&E functions of the existing S&T explosives countermeasures portfolio along with those of the Transportation Security Administration program. The resulting integrated portfolio will then encompass and support the true objective of the explosives countermeasures technology program: to prevent, detect, respond, and mitigate the use of explosives in attacks against the population, mass transit, civil aviation, critical infrastructure and key assets. This consolidation allows for an expansion of the scope and number of programs within the explosives countermeasures portfolio in comparison to the current FY 2004 and FY 2005 and planned FY 2006 activities. Programs include explosives marking, smuggling, aviation security, suicide bomb interdiction, and vehicle bomb interdiction.

FY 2006 Science and Technology Directorate Initiatives

The S&T budget request includes funding for a number of mission-critical initiatives.

- **National Bio and Agrodefense Facility [$23 million]**

  The National Bio and Agrodefense Facility (NBAF) will extend the capabilities of the National Biodefense Analysis and Countermeasures Center (NBACC) for threat characterization, forensics, and detection to defend both animal and public health. Research, development, test and evaluation at the NBAF will strengthen the Nation's ability to anticipate, prevent, respond to, and recover from the intentional introduction of high consequence biological threats, such as Foreign Animal Diseases. The S&T Directorate will focus on developing and testing the technical means to prevent attacks on agriculture and humans and strengthening the capability to respond to an attack, recover from an attack, reconstitute the agricultural economy and infrastructure, and provide a means to identify the bioterrorists and bring them to justice. The NBAF will enhance situational awareness of the health of the American populace, animals, plants, food supply, and environment, and result in better informed decision-making and a quicker federal, State, and local response to foreign animal and zoonotic diseases. The capabilities provided by the NBAF meet the requirements of HSPD–9 and HSPD–10. The National Bio and Agrodefense Facility will ensure healthy livestock for the 21st century and protect the public.

- **Low Volatility Agent Warning System [$20 million]**

  An additional $20 million is provided to develop the Low Volatility Agent (LVA) Warning System, which will serve as the basis for a warning and identification capability against a set of chemical threat agents whose vapor pressure is sufficiently low that detection by conventional approaches is exceptionally difficult. This set of low volatility agents includes some of the most toxic materials currently known. The Chemical Countermeasures portfolio has initiated an effort to develop a transportable capability for the detection of these materials in a response and recovery mode. This R&D effort is referred to as LVA Surface Contamination Monitor. The additional FY 2006 funding will be used to develop a protection-mode capability to detect these materials upon release in specific environments. This detect-to-warn system will alert the response system of the imminent hazard and enable protection of potential victims from exposure and permit application of prompt medical countermeasures to minimize or eliminate casualties. This system will be a network of detectors to provide a protect-to-warn capability for specific venues, such as high-value buildings and transit systems. The LVA Warning System will both detect and identify the agent to ensure correct medical countermeasures are engaged.

- **Radiological/Nuclear Countermeasures Test and Evaluation Complex [$9 million]**

  The Radiological/Nuclear Countermeasures Test and Evaluation Complex (Rad/NucCTEC), part of the DNDO, will provide the Nation with the necessary facilities and capabilities to validate the performance of systems under development, and already deployed, to protect the United States from the threat of a terrorist radiological or nuclear attack. Located on the Nevada Test Site, the Rad/NucCTEC will be a unique national asset, permitting classified high-fidelity testing of radiological/nuclear sensors and sensor systems utilizing strategic quantities of special nuclear materials in realistic configurations. The Rad/NucCTEC will provide the Nation with the capacity to rapidly evaluate the performance of our current and developing homeland defenses against validated threats, using actual radiological and nuclear materials, for which no facility currently exists.

- **Counter–MAN Portable Air Defense Systems (C–MANPADS) [$49 million]**

  C–MANPADS' increase of $49 million plus $61 million of base funding equal to a total funding level of $110 million in FY 2006. If deemed appropriate based on the Phase II results and approval from Congress, the Counter–MANPADS Program will initiate Phase III to include delivery and installation of pre-production Counter–MANPADS equipment on commercially operated aircraft by U.S. cargo carriers similar to those aircraft dedicated to meet the Civil Reserve Air Fleet (CRAF) requirement. To foster competition, the additional funds will be used to maintain two contractors in Phase III. In FY

2006, each contractor will update its designs to incorporate new design requirements including reliability improvements, technology protection, and emergency ground notification. Operational testing and evaluation will be performed on multiple aircraft types to capture true operational and maintenance costs as well as technical performance and reliability data. In FY 2006, twenty operational aircraft will be modified and sixteen Counter–MANPADS systems will be procured to support reliability and test data collection and critical technology protection measures. This information is critical to further maturing the life cycle cost impact analysis to the airlines, and the extensive reliability analysis will be used to validate and improve system reliability. Dialogue with Original Equipment Manufacturers (OEM), such as Boeing and Airbus, will be initiated and studies conducted to scope the effort required to include provisions for Counter–MANPADS systems on future production aircraft. Additionally, live fire test evaluations will provide insight into the overall effectiveness of the system installed on commercial aircraft. Finally, Federal Aviation Administration (FAA) certification will be completed for additional relevant aircraft types/models/series not addressed in Phase II.

- **Research and Development Consolidation [$127.5 million] (67 FTE)**

  The Transportation Security Administration (TSA), the United States Coast Guard (USCG), the Bureau of Customs and Border Protection (CBP) and the Information Analysis and Infrastructure Protection (IAIP) will integrate their RDT&E activities with those conducted within the Department of Homeland Security's S&T Directorate. This consolidation will bring the scientific and engineering personnel and other RDT&E resources of the Department under a single accountable authority. The S&T Directorate's vision for this RDT&E integration will be to start the development and expansion of collaborative relationships, foster and leverage an environment of collective capabilities, maximize the efficiency and effectiveness of the Department's RDT&E capacity as well as develop and expand synergistic RDT&E programs that cut across the Department's activities. Bringing RDT&E under the S&T Directorate will allow the other organizational elements to collaborate in the RDT&E integration and to focus on their operational missions, and eliminate within them the specialized management infrastructure required to manage RDT&E. The FY 2006 R&D Consolidation budget is $127,497,000 of which $10,600,000 is in support of 67 FTEs and $116,897,000 is for RDT&E.

In addition to the RDT&E activities conducted at the portfolio level, the Science and Technology Directorate is committed to additional activities that both facilitate and enhance the research efforts of the portfolios. The Directorate places significant emphasis on its interfaces with other government agencies as well as the transfer of technology to other directorates and agencies.

Studies and Analysis

The Homeland Security Science and Technology Advisory Committee (HSSTAC) and the Homeland Security Institute (HSI) constitute the major activities of Studies & Analysis. Both were established under the *Homeland Security Act of 2002* to provide independent scientific & technical analytic expertise to the Department through the Under Secretary for Science and Technology. HSSTAC operates under the Federal Advisory Committee Act. HSI operates in accordance with regulations governing Federally Funded Research and Development Centers. By charter, each engages in substantial contact with other agencies, private sectors, and other entities to facilitate communication, identify issues, and bring the best advice to the Department and the Government.

The Homeland Security Science and Technology Advisory Committee (HSSTAC)

The HSSTAC, established in November 2003, was chartered to be a source of independent scientific and technical planning advice for the Under Secretary for Science and Technology. It is solely advisory in nature and focuses on the responsibilities of the Under Secretary for Science and Technology to organize the Nation's scientific and technological resources to prevent or mitigate the effects of catastrophic terrorism against the United States; identify research areas of potential importance to the security of the Nation; assist in establishing mission goals for the future; advise on whether the policies, actions, management processes, and organization constructs of the Science and Technology Directorate are focused on mission objectives; advise on whether the research, development, test, evaluation, and systems engineering activities are properly resourced (capital, financial, and human) to

accomplish the objectives; identify outreach activities; and, review the technical quality and relevance of the Directorate's programs.

During the past year HSSTAC met, either in part or in whole, with the following:

- Port Authority of New York & New Jersey—To evaluate the needs and operational requirements of the BioWatch and Rad/Nuc detection programs.
  - Port Authority Police Department
  - George Washington Bridge
  - Holland Tunnel
  - Howland Hook Marine Terminal
- NYC Office of Emergency Management—To meet with senior leaders and gauge their assessment of the BioWatch program
- NYC Public Health Laboratory—To observe the sample testing phase of the BioWatch program.
- Department of Energy National Laboratories (Sandia National Laboratory, Lawrence Livermore National Laboratory, Pacific Northwest National Laboratory, Los Alamos National Laboratory)—To learn about the various homeland security technology capabilities found in the National Labs and discuss with senior leaders how such laboratories can best serve the Nation.
- Food & Drug Administration—The Acting Commissioner and other senior leaders to assess how DHS and FDA determine and implement respective roles and responsibilities regarding disease detection.
- Department of Health and Human Services—Assistant Secretary and senior staff from the Centers for Disease Control to discuss how DHS and HHS determine and implement respective roles and responsibilities regarding disease detection.

Annual Report to Congress: The Committee's overarching conclusions are:

- The S&T Directorate has made notable progress in organizing, establishing processes, establishing relationships with other Department of Homeland Security (DHS) activities and with the broader community relevant to homeland security.
- The Directorate's strategic planning process is underway but needs staffing, clear intent and guidance, metrics useful to set priorities, and methodologies for planning and assessments.
- The Directorate has become the default operator of some fielded systems; focusing on operating fielded systems will divert both attention and resources needed to develop the needed new and improved capabilities.
- The Directorate needs to focus on the needs of multiple publics with distinctly different needs.
- A major objective of homeland security activities should be to build public resiliency to a wide range of possible attacks.
- Understanding a wide range of specific threats is essential to understanding and addressing vulnerabilities to potential disruptive assaults.
- To achieve the national goals in homeland security, DHS needs to take the lead in fashioning a mechanism for coordination and cooperation among the relevant federal research and development (R&D) activities.
- A larger growth rate is needed to build programs, infrastructure and capabilities.
- The S&T Directorate needs to define in some detail what kind of relationship it believes is needed with the DOE labs to meet DHS needs.

Homeland Security Institute

The Homeland Security Institute is a Federally Funded Research and Development Center (FFRDC) operated and managed by Analytic Services Inc. to provide independent, objective studies and analyses to address critical homeland security issues, particularly those that require scientific, technical, business systems, and analytical expertise. The HSI is a strategic resource for the Department with the Under Secretary for Science and Technology (S&T) serving as primary sponsor on behalf of the Secretary. HSI programs crosscut DHS organizational lines and involve Coast Guard, BTS, EP&R, IAIP, as well as S&T Directorate components. In order to provide dedicated, multi-disciplinary, critical analysis and decision support capability for DHS department-wide, HSI engages other agencies and broader com-

munities as necessary to better inform DHS and to apply "dual-benefit" approaches directly into program planning.

During the past year HSI conducted the following studies that involved other federal agencies:

- National laboratory capabilities assessment—conducted an extensive survey of homeland security capabilities resident in the Department of Energy national laboratories.
- Cargo summit—facilitated private sector communications and provided analysis on the national cargo security strategy including Department of Transportation, Federal Highway Administration, Department of State, Department of Defense.
- Critical Infrastructure Protection Vulnerability Studies with Department of Energy (to include the National Laboratories), United States Department of Agriculture, Food and Drug Administration, Department of Transportation, United States Coast Guard, National Transportation Safety Board, White House Office of Science and Technology Policy, Amtrak.
- Wide Area Biological Restoration study involves Environmental Protection Agency, Health and Human Services, National Institute of Health, Department of Defense (U.S. Army Center for Health Promotion and Preventive Medicine), United States Postal Service, Department of State, Department of Energy National Laboratories, Department of Justice, Federal Bureau of Investigation, Central Intelligence Agency, United States Department of Agriculture, General Services Administration, Technology Surprise Working Group, Department of Labor.
- Reasons for Successful and Unsuccessful Terrorist Incidents Against the U.S.—Federal Bureau of Investigation, Department of Justice, Department of State.
- Threat and Technology Assessments—Central Intelligence Agency, Defense Intelligence Agency, U.S. Army, U.S. Air Force, U.S. Navy, U.S. Marine Corps, National Aeronautics Space Agency, Technology Surprise Working Group, National Ground Intelligence Center, Office of Science and Technology Policy.

Division of Effort Among the DHS S&T Directorate and Research Efforts at Other Government Agencies

One of the accomplishments of which I am personally most proud is the emphasis our new Directorate has put on interacting with other federal departments and agencies. Knowledge of other science and technology programs and their results, appropriate collaboration between agencies, coordination of relevant programmatic activities, and information sharing are essential for us to best meet our mission requirements.

The Science and Technology Directorate recognizes that many organizations are contributing to the science and technology base needed to enhance the Nation's capabilities to thwart terrorist acts and to fully support the conventional missions of the operational components of the Department. Congress recognized the importance of the research and development being conducted by numerous federal departments and agencies, and, in the *Homeland Security Act of 2002,* directed the Under Secretary for Science and Technology to coordinate the Federal Government's civilian efforts to identify and develop countermeasures to current and emerging threats.

We take this responsibility very seriously.

Over the last year, the Science and Technology Directorate has worked with the Office of Science and Technology Policy, the Homeland Security Council, the National Security Council, the Office of Management and Budget and the Office of the Vice President to initiate the effort to coordinate homeland security research and development across the entire United States Government. It will come as no surprise to the members of this Subcommittee that good, solid, effective research and development relevant to homeland security is being conducted by the Departments of Agriculture, Commerce, Defense, Energy, Justice, Health and Human Services, State, and Veteran's Affairs; within the National Science Foundation, the Environmental Protection Agency and other federal agencies; and by members of the Intelligence Community.

Several interagency working groups already exist that are addressing issues important to homeland security. The Science and Technology Directorate has been, and continues to be, an active participant in these working groups, and in most cases has taken a leadership role. These fora foster an active exchange of information and assist each participating agency in identifying related needs and require-

ments, conducting research and development of mutual benefit, and avoiding duplication of effort.

We also continue to have discussions at multiple levels of management with federal departments and agencies, as well as with the Office of Management and Budget, the Office of Science and Technology Policy, and the Homeland Security Council. These discussions ensure that the strongest possible links are made and the best possible coordination occurs between our Department and those who are conducting sector-specific research.

A full list of S&T Directorate interagency interactions and their results are listed in the Appendix.

Technology Transfer

We are often asked about the transfer of technologies between Departments. I want to assure you that the Science and Technology Directorate is very concerned about technology transfer. Often, technology developed for one purpose, such as a military application, cannot be transferred in a straightforward manner to civil operations. The requirements for maintenance and support, for performance, and for total cost of ownership often inhibit such transfers. Although the basic scientific principles that underpin a particular technology may be leveraged, nevertheless significant re-engineering is required to make the technology suitable for homeland security purposes.

Other issues associated with transferring technologies to the homeland security operating environment include the need for ease of operations, extremely low total cost of ownership, providing liability relief, providing incentives for non-federal actors to purchase useful technologies, developing and promulgating standards and providing technical assistance to aid those purchasers in their procurement decisions. While the Department has made tremendous progress in all these areas, much remains to be done, and sustained effort is needed.

Short-Term and Long-Term Research

In the two years that this Department has been in existence, the Science and Technology Directorate has focused its efforts on near-term development and deployment of technologies to improve our nation's ability to detect and respond to potential terrorist acts. However, we recognize that a sustained effort to continually add to our knowledge base and our resource base is necessary for future developments. Thus, we have invested a portion of our resources, including our university programs, toward these objectives. The following table indicates our expenditures in basic research, applied research, and development to date.

Science and Technology Directorate R&D Investments (in millions of $)			
Fiscal Year	**FY 2004(actual)**	**FY 2005(estimated)**	**FY 2006(proposed)**
Basic	68	85	112
Applied	243	340	399
Developmental	470	587	746
Total	**781**	**1012**	**1257**
% Basic	**8.7%**	**8.4%**	**8.9%**

Our expenditures in basic research are heavily weighted by our investments in university programs. These university programs will not only provide new information relevant to homeland security, but will also provide a workforce of people who are cognizant of the needs of homeland security, especially in areas of risk analysis, animal-related agro-terrorism, bioforensics, cybersecurity, disaster modeling, and psychological and behavioral analysis.

Basis for Policy on the Use of the National Laboratories

The Department of Homeland Security recognizes the unique technical expertise and infrastructure at the Department of Energy national laboratories. The Science and Technology Directorate has and will continue to maximize and leverage the existing capability base at the national laboratories to address DHS strategic objectives. The S&T Directorate will use strategic partner laboratories to assist in devel-

oping program direction, and we will make strategic investments in the national laboratories to build an enduring national capability for DHS. For example, the S&T Directorate is creating technical centers within the national laboratories where expertise currently exists in specialized areas, such as a visual analytics center and a biodefense knowledge center.

The Directorate submitted a Report to Congress on the "Utilization of the National Laboratories" last October which describes the Science and Technology Directorate's policy regarding the use of the national laboratory resources. The report details how the Science and Technology Directorate has translated its performance-based management philosophy into annual rigorous processes for program planning, program execution, and program reviews. Through this annual cycle, work performed at each of the laboratories is peer reviewed and funding decisions for the following year are based on the annual performance reviews.

Staffing

When the Department of Homeland Security stood up on March 1, 2003, the S&T Directorate had a total staff of about 87, including the 53 staff transferred from the Department of Energy's Environmental Measurements Laboratory.

Two years later, we have a staff of nearly 450, including 167 DHS employees, Nine Public Health Service Officers, 32 Intergovernmental Personnel Act employees, 17 individuals on assignment from other agencies, and 223 contractors.

We continue to be active in staffing our Directorate with well-qualified individuals whose skills support the full breadth of our responsibilities and RDT&E activities. We continue to actively seek additional staff in accordance with our approved staffing plan.

Conclusion

With nearly two years under the Department's belt, the scientists and engineers in the Science and Technology Directorate have accomplished more than I could have expected. I am proud to have shared with you today some of those success stories. We have appended a more comprehensive summary of accomplishments to date for the record.

We also recognize that there is much to do, and we will be working just as hard in FY 2006.

I look forward to continuing to work with the Science Committee, my colleagues here today, other federal departments and agencies; the academic community; and private industry to continue the work begun and continually improve our ability to protect our homeland and way of life.

Appendix A

Accomplishments of the Science and Technology Directorate
Department of Homeland Security
FY 2004 to February 2005

Biological Countermeasures

- Deployed additional environmental sensor systems to new metropolitan areas to protect our nation's cities from the threat and ramifications of a bioterrorist attack. BioWatch activities were significantly increased during the National Code Orange Alert (December 2003–January 2004), with twice daily samplings in the high threat cities, additional collectors for special New Year's events and Bowl Games, and deployment of temporary BioWatch systems to non-BioWatch cities of special concern. BioWatch also provided field and laboratory support to the G8 Conference, the Democratic National Convention, and the Republican National Convention in Boston and New York, respectively.
- Continued to develop new technologies to support biosurveillance and detection. Two detection R&D programs transferred to DHS from the DOE's Chemical and Biological National Security Program (CBNP) are reaching their successful conclusion. The Autonomous Pathogen Detection System that provides for totally automated integrated sample collection and analysis is now undergoing field-testing in New York City, while the hand-portable chemical and biological detection system known as micro-ChemLab is one of the leading contenders for the next generation DOD Joint ChemBio Modular Detector. High throughput processing techniques that will greatly increase BioWatch capability have been developed and are being piloted as part of the second generation BioWatch system known as Gen 2 BioWatch. This pilot is in the process of being deployed in New York City and will involve a two-to-threefold expansion of the number of collectors at locations to be specified by the city (e.g., high profiles venues, subways, transportation hubs) with an even greater increase in sample analysis capability so as to support surge activities and the extensive follow-on analysis that would have to be done in the wake of an actual event. Efforts are underway in the BioNet program to develop integrated concept of operations with civilian and military bio-monitoring systems (e.g., BioWatch and the Joint Service Installation Pilot Program (JSIPP)/Guardian) using San Diego, California, as the pilot site. Solicitations and awards for next generation biological detection systems to support a fully automated BioWatch (Gen 3) and to enable very rapid detection (about two minutes) for protecting special events and selected facilities have been made. However, these detection systems are only as good as the underlying bioassays which recognize the agents of interest. These assays are designed to detect multiple features in an organism so as to produce very low false alarm rates, less than one in a million.
- Initiated the design of National BioSurveillance Integration System (NBIS) as part of an interagency process. When completed in the first quarter of FY 2005, we will work with the Information Analysis and Infrastructure Protection (IAIP) Directorate to implement this system.
- Developed a set of ChemBio Defense Guidelines for Airports that are currently out for review at five major airports around the country through the Protective and Response Options for Airport Counter Terrorism (ProACT). This program, The Airport Restoration Demonstration, at the San Francisco International Airport (SFO), is working with EPA, CDC and SFO to develop a set of pre-approved protocols and decontamination agents for decontamination and return to service of major airport facilities. As part of this, the National Academy of Sciences is conducting a study of "How clean is clean?" the final report will be completed in the spring 2005. Work is on-going on improvements to technologies for facility clean-up, including improvements in chlorine dioxide and vaporous hydrogen peroxide approaches and the completion and testing of a truck-deployed chlorine dioxide based decontamination system.

- Using the reference scenario approach recommended by HSPD–10 for understanding the requirements of an integrated national biodefense architecture, the portfolio will complete the high-level analyses of four baseline references cases: a large outdoor release of a non-contagious agent (anthrax); a large indoor release of a contagious agent (smallpox); contamination of a bulk food supply; and two highly virulent agricultural attacks, one on livestock (Foot and Mouth Disease) and the other on plants (soy bean rust). Completion of the architectures will identify key requirements for each major element, a "report card" on the current and projected status in that area and performing detailed design tradeoffs for those areas in which DHS has execution responsibility.
- Two material threat determinations have been made (anthrax and botulinum) in support of BioShield and risk assessments have been performed to help understand the plausible worse case scenarios and help guide the size of the BioShield procurements.
- BASIS was used to provide additional support for the designated National Special Security Events (NSSEs) to include the 2004 G–8 Conference, and the Democratic and Republican National Conventions.
- A National Strain Repository will be established to allow comparison of suspect samples with known existing strains. Genotyping assays will be completed for anthrax and be well underway for the next two high priority agents determined by NBFAC and the law enforcement community.
- Initiating operations in interim facilities until completion of construction of the new NBACC facility currently scheduled for FY 2008/2009. Arrangements have been made for use of BSL–2/3 aerosol laboratory capabilities through partnerships and agreements with Lovelace Respiratory Research Institute, Battelle Memorial Institute and the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) and for use of BSL–2/3/4 with DOD, USDA Food Safety and Inspection Service (FSIS), and CDC.
- A systematic biothreat risk analysis process has been initiated with broad involvement from government, industry and universities. Technical support has also been provided to the Emergency Preparedness and Response Directorate of DHS and to the CDC to assist in understanding the requirements on the Strategic National Stockpile.
- HSPD–10 designates the National Bioforensics Analysis Center (NBFAC) as the lead national facility for technical analysis of forensic samples from biological events. Pending completion of the NBACC construction, a 3,000 square foot dedicated microbial forensics laboratory has been established at USAMRIID and is currently handling some 1500 samples. A joint governance model is being developed with the FBI and others and a broad based interagency meeting was held to identify R&D requirements.
- Successfully addressing operational issues at the Plum Island Animal Disease Center (PIADC). Improved security procedures have been implemented and a new Operations and Maintenance Contractor is in place. An integrated USDA–DHS research strategy, and development, including a detailed veterinary countermeasures and diagnostics strategy, has been developed. R&D programs have been initiated to evaluate improved variants of commercial animal vaccines, develop and deploy the next generation multiplexed diagnostics assays to rapidly and unequivocally identify foreign animal diseases (FAD) such as Foot and Mouth Disease (FMD), and to implement a bioforensics capability for FADs.

Chemical Countermeasures

- Initiated a process to define the requirements and process for a robust national environmental analytical laboratory capability through a core interagency working group including EPA, CDC, and other stakeholders under DHS Chemical Countermeasures leadership. The design of triage laboratory capability to support analyses of complete unknowns was completed. The portfolio conducted preliminary activities toward the development of a Chemical Security Analysis Center (CSAC) that will provide threat awareness and assessment. An overall structure, similar to that characterizing the NBACC and its supporting threat characterization, forensics, knowledge management and reachback, is envisioned. Interfaces with the FBI and Scientific Working Group for Forensic Analysis of Chemical Terrorism (SWGFACT) identified shortfalls in current forensics capabilities and infrastructures and facilitated

the initiation of a comprehensive program to address technical deficiencies. Baseline forensics signatures were established, and an initial set of laboratory forensics protocols were developed.

- Initiated prototype development for a Mobile, High-Throughput Lab ID System. This system is a self-contained mobile laboratory for on-site chemical analysis of a high volume of samples to support comprehensive assessment of a chemical incident scene and to monitor progress of restoration activities. There is no current capability for on-scene assessment and screening of environmental samples to streamline the process of remediating a contaminated site. As has been demonstrated by previous cases of chemical contamination of the environment, very large numbers of samples must be analyzed to determine extent of contamination and then support decisions to re-use after decontamination procedures. Accordingly a high-throughput (possibly 1000 per day) sample stream must be supported. Design the concept and demonstrate the prototype in 2005.
- Development of a playbook containing restoration protocols following a chemical incident was initiated. Studies were initiated to develop and evaluate decontamination technologies for non-traditional agents.
- Deployed a chemical threat detection system to Boston and New York City transit stations for the Democratic and Republican National Conventions, respectively. The system will also be deployed for the 2005 Presidential Inauguration. The system was based on the Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism (PROTECT) chemical agent detection system recently transitioned to the Washington, D.C., Washington Metropolitan Area Transit Authority (WMATA) metro system, which has operated for a year without a false alarm. The system provides prompt detection of a chemical attack to effect optimal response actions. The system deployed to New York City is being left in place as an initial permanent capability.
- Initiated systems studies around three defining scenarios: indoor chemical agent release, outdoor toxic industrial chemical release, and release of toxin in the water system. Primary components of these defining architectures were developed and serve as the basis for continued definition of capability gaps and required improved countermeasures. Development of these architectures and resultant guiding principles will be coordinated with DHS IAIP as well as other government agencies to maximize cross-agency leverage. Three demonstration projects were also initiated: The Facility Restoration Demonstration Project will develop and demonstrate a capability to restore a facility that has been contaminated with a classical chemical agent or persistent toxic industrial chemical (TIC). A Water Security Demonstration will identify and characterize technologies with the potential to provide warning of chemical contamination of the water system. A NSSE Deployable Detection System Demonstration will develop a flexible architecture chemical detection system that can be utilized for the warning and situational awareness of chemical threats in temporary deployments.
- Initiated key development programs targeting leap-ahead advancements in detection. These programs will develop two principal capabilities: a facility monitoring detector and a responder detection tool. In both cases, the detectors will provide detection and discrimination of up to 20 different chemical threats, including classical chemical warfare agents (CWAs) and toxic industrial chemicals (TICs) in a single unit across a wide range of concentrations. Current chemical detectors address far fewer chemical agents. These new detectors will be network-compatible to provide comprehensive situational awareness and, in facilities, will initiate response actions to mitigate the threat as appropriate. A workshop was conducted to gather and discuss technology solutions for the challenge of detecting very low vapor pressure chemical hazards. A program to develop such technologies was formulated.

Radiological and Nuclear Countermeasures

- Presently developing new capabilities and a corresponding architecture for detection of nuclear materials through a new coordinating office, which will outline an investment strategy for nuclear material detection R&D as well as procurement and deployment of next-generation technologies.
- Expanded secondary-reachback to include all instrumented Customs and Border Protection's POEs and personnel, and U.S. Coast Guard special teams: Expert reachback required to resolve highly suspicious or highly anomalous

alarms will be expanded to cover all sites and personnel within the Bureau of Customs and Border Protection (CBP) and USCG that use/carry radiation detection equipment.

- Radiological and Nuclear Countermeasures Test and Evaluation Complex: Provides capability to conduct controlled field testing of special nuclear material (SNM) in their most relevant configuration in mock essential operational venues. Initial capabilities will come on-line at the end of 2005.
- Assumed management of the Port Authority of New York and New Jersey radiation detection test bed from the Department of Energy in August, 2003. Following the transfer, the portfolio broadened the project scope beyond testing and evaluating individual pieces of technology to a systems approach, including response protocols and operational concepts. This program has been renamed the Countermeasures Test Bed to more accurately reflect the span of the project.
- The portfolio will initiate a joint DHS/HSARPA and DOD/DARPA (Department of Defense/Defense Advanced Research Projects Agency) project focusing on radiological and nuclear decontamination, consisting of four main tasks: (1) Radionuclide capture decontamination; (2) Wide area radionuclide decontamination; (3) Verification; and (4) Modeling.
- Further efforts will begin under the Environmental Measurements Lab's (EML) Urban Dispersion Program (UDP), an atmospheric dispersion modeling effort to model the release of airborne hazardous materials in New York City. Initial work on this project will begin with radiological and meteorological network installation plans as well as survey measurements of SF6 (tracer) background in the city being completed this year. Additionally, a crisis response scenario analysis was conducted to identify technologies and capabilities needed for crisis response. EML is also currently running the Incident Management Radiological Monitoring Network in New York City, an operational test bed for radiation sensor systems that can be used for search and characterization by local first responders. In August 2004, additional sensor nodes were installed and established throughout the city, at sites selected in conjunction with New York's Office of Emergency Management (NYCOEM).
- Needs and technical approach analyses for both passive and active interrogation detection technologies. Several advanced passive detector technologies are in the early stages of development: an inexpensive, deployable, high efficiency neutron sensor; a large area combined neutron/gamma detector; a large-volume high-pressure xenon (HPXe) detector; a directional detector for fast neutrons; and a mercuric iodide (HgI2) detector. The large-volume HPXe detector is currently in the prototype phase. Also in development are two gamma-ray imaging systems, one based on Compton imaging and the other on coded aperture imaging; both are currently in early prototyping phases. Additional efforts focused on the detection of shielded SNM in cargo containers, based on the detection of both neutrons and delayed high-energy fission product gamma rays, and a portable neutron source, based on a mixed alpha-Be source in a switchable configuration for use in active interrogation; both currently are still in conceptual design and experiment phases.
- Improvements in two current Customs and Border Protection-deployed radiographic imaging systems. This included software improvements and systems upgrades for local data integration, threat image projection (TIP), and assisted imaging processing (AIP). Efforts are expected to begin in the 4th Quarter of FY 2004 for work on near-term improvements in hand-held radioisotope identification (RIID), area search devices with radioisotope identification, passive primary portals, advanced radiography systems for cargo and parcels, and advanced active imaging and screening systems.
- An additional effort is directed towards a comprehensive chemical, biological, radiological and nuclear (CBRN) water system vulnerability study.
- Further efforts were begun under the Environmental Measurements Lab's (EML) Urban Dispersion Program (UDP), an atmospheric dispersion modeling effort to model the release of airborne hazardous materials in New York City. Initial work on this project has begun, with radiological and meteorological network installation plans as well as survey measurements of SF6 (tracer) background in the city being completed this year. Additionally, a crisis response scenario analysis was conducted to identify technologies and capabilities needed for crisis response. EML is also currently running the Incident Management Radiological Monitoring Network in New York City, an operational test bed for radiation sensor systems that can be used for search and

characterization by local first responders. By August 2004, additional sensor nodes will have been installed and established throughout the city, at sites selected in conjunction with New York's Office of Emergency Management (NYCOEM).

Explosives Countermeasures

- Initiated the development of a prototype explosive detector for vehicle bombs, and accelerated the development of hardened overhead storage bins for passenger aircraft. Additionally, it initiated a survey and evaluation of commercial-off-the-shelf (COTS) equipment to detect, interdict and mitigate the consequences of suicide bombers and vehicle bombs, and conducted a cost-benefit analysis of approaches to aircraft hardening.

Threat and Vulnerability Testing and Assessment

- Delivered two operational components, the Threat Vulnerability Integration System (TVIS) and the Threat-Vulnerability Mapper (TVM), to the IAIP Directorate. The TVM provides counterterrorism analysts with a simple, straightforward way to depict the geographic distribution of threats across the U.S. and to search the underlying databases for information on the possible actors, agents, potential severity of attacks, and extent of the vulnerabilities to and effects of such attacks. TVIS integrates high-volume information analysis capabilities with specialized visualization tools that enable analysts to process large amounts of disparate intelligence data.
- Created the Interagency Center for Applied Homeland Security Technology (ICAHST) capable of addressing the technical needs of the Department and other members of the Homeland Security community. The center and its interconnected laboratories provides detailed technical information and guides research, strategy, and systems design for the broad range of technologies and techniques necessary to identify, understand, and remediate CBRNE threats. The center consolidates and validates the S&T Directorate's and other customers' technical requirements as well as performs comprehensive technical evaluations of technologies either available through commercial, academic, or government sectors or being specifically developed through the various TVTA research programs. The ICAHST activity is supported by an interagency Steering Group with representatives from 23 intelligence and law enforcement agencies.
- Completed an initial set of 120 all-CBRNE capability assessments for 20 terrorist organizations on the five CBRNE plus cyber threat agents. Continued support to the Nuclear Assessment Program (NAP) that judges the credibility of communicated nuclear threats for such clients as the FBI, DOE, and Department of State (DOS).
- Created the National Visualization and Analytics Center (NVAC). NVAC creates a national agenda document for visual analytics with broad input and support from the government, national laboratories and universities and provides the following four core functions: research and development, education, technology evaluation and implementation, integration and coordination. NVAC is expected to address the intrinsic challenges of:
  - Dealing with massive streams of information in support of the analysts;
  - Visualization of information for detecting deception and resolving uncertainty;
  - Visualization of temporal primary and supportive theme relationships critical for proactive and predictive analytics; and
  - New, multi-dimensional visualization tools for human-information discourse, which enable analysts to query, cluster or group, and manage multiple types (for example, databases or unstructured text) and modes (such as text, audio, video, imagery, or sensor) of data or information as well as incomplete data streams.
- Establish an integrated, national capability, called the Institute for Discrete Sciences (IDS), to investigate and develop the specialized computing algorithms and hardware architectures necessary to analyze massive amounts of diverse data from multiple, disparate, distributed data sources, and to model terrorist attacks and simulate consequences on a real-time, high-resolution basis. Like the NVAC, the IDS will have broad interaction and support from the government, national laboratories and universities.

- Complete an engineering design for the Enhanced International Travel Security (EITS) system, initiated in FY 2004, which will enable several pilots to be implemented with the United Kingdom, Canada, and Australia. EITS allows the validity of travel documents and the identity of travelers to be determined in real-time at U.S. borders and other points of entry.
- Provide the science and technology needed in the development of biometrics for precise identification of individuals, and develop prototype instrumentation to aid authorized officials in detecting individuals with potentially hostile intent.
- Enable a comprehensive capability for determining terrorist motivations, based on social, behavioral, and economic factors. Integrate this with techniques for determining terrorist or hostile intent as well as detecting deception.

Standards

- Continued development of the First Responder Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) Protective and Operational Equipment Standards Development Program, an ongoing comprehensive, multi-year program that is developing an integrated suite of national standards for emergency responder CBRNE protective and operational equipment.
- Developed standards that address radiation protection for all activities corresponding to the EP&R mission.
- Developed comprehensive standards for the development, testing, and certification of effective detection, response, remediation, and forensics tools for radiological and nuclear materials.
- Composed three management directives to establish DHS policy with regards to the adoption and development of national standards. Two of the management directives dealing with DHS internal standards policies have been issued. In addition to establishing policy, the standards program has engaged with the American National Standards Institute (ANSI) to develop a searchable database containing existing standards related to homeland security and to establish the ANSI Homeland Security Standards Panel.
- Formed an interagency task force to address the controversy over the effectiveness and use of lateral flow immunoassays for the detection of Bacillus anthracis (anthrax) by emergency responders. Five commercially available hand-held immunoassays and two reference methods have been tested and evaluated in a multiple laboratory study. Other accomplishments in biological countermeasures include an effort with Edgewood Chemical Biological Center (ECBC) to evaluate a five step method to pre-screen suspicious white powders, an effort with NIST to look at the effectiveness of biological agent simulants, and the establishment of a program to address both chemical and biological decontamination standards for the first responder community. A draft standard for a hand-held vaporous chemical warfare agent detector was developed. A project was initiated to provide both physical standards and validated spectral libraries necessary to impart confidence in the performance of portable Raman spectrophotometers (currently in use by first responders to identify unknown substances in real-time with minimal handling). Other accomplishments include participation in the development of Protective Action Guides following a RDD/IND event; the development and adoption of the first radiological and nuclear detector for four classes of radiation detection equipment ranging from hand-held alarming detectors to radiation portal monitors for cargo containers; the development and evaluation of the four accompanying test and evaluation protocols; testing of relevant COTS radiation detection equipment; production of standardized test sources (γ-ray, neutron); and the initiation of an effort to develop performance specifications for active interrogation systems (x-ray, gamma-ray, and neutron imaging) used in the detection of SNMs. High explosive countermeasures initiatives include standards for explosives reference materials, trace explosive detection devices, and explosive mitigation equipment standards. The high explosives standards program is leveraging programs funded by the Department of Justice's National Institute of Justice to develop performance metrics for bomb disposal robots, and to develop a bomb suit standard. Cyber Security programs were initiated to address E-Authentication (for remote authentication techniques), Forensics for Personal Digital Assistant (PDA)/Handheld Devices, and Checklists for Securing Operating Systems and Application Configurations. Specific accomplishments include an exploratory workshop on knowledge based authentica-

tion, general approach to password authentication strength, guidance document on PDA forensic policies, guidance document on current forensic software for PDAs, draft guideline for the overall Security Configuration Checklists Program, and a draft Special Publication 800–68 Guide for Securing Microsoft Windows XP Systems for IT Professionals. A list of prioritized requirements for CBRNE countermeasures standards will be constructed based upon the interagency working group's efforts. In addition, a report and database on existing CBRNE countermeasures standards will be issued. New standard development will focus on validation of existing, high priority, high use technology for CBRNE detection Polymeric Chain Reaction (PCR) devices, Raman spectrophotometers, spectroscopy based portal monitors, neutron detectors, high energy x-ray interrogation systems, neutron interrogation systems, trace explosive detection devices, and explosion mitigation devices). In addition, work on characterizing the performance of candidate CBRNE simulant and reference materials will expand. Efforts will be expanded in the area of CBRNE decontamination standards. Efforts will be initiated to develop COTS and Government-off-the-shelf (GOTS) CBRNE equipment consumer report guides based on FY 2004 testing results. To address Cyber security standards the programs for E–Authentication, Forensics for PDA/Handheld Devices and Checklists for Securing Operating Systems and Application Configurations will be continued, along with a new start to develop a Standardized Mechanism for Universal Access Control to enable and promote sharing of information across organizational boundaries each with potentially different access control policies. The standard access control mechanism program will survey existing access control policies and models identify and document access controls most primitive and atomic principles and functions and design a universal access control mechanism capable of abstracting, combining and enforcing all existing attribute based access control policies.

- A standard for full frontal facial photographs entitled "Face Recognition Format for Data Interchange" developed by the International Committee for Information Technology Standards (INCITS) is currently in the process of being formally adopted by DHS. A biometrics working group was established to gain consensus on the adoption of the standard. A contract is being negotiated with INCITS that will give access to the standard to DHS employees and contractors via the DHS website. Supported a program to develop a portable, externally deployable, biometric acquisition and information system, designed specifically for collecting data for evaluation.
- Continue work with ASTM International to obtain final approval for the Hospital Preparedness Standards and the METL standard for first responders. New initiatives with ASTM on homeland security standards will include a standard guide for building event dispersion and health assessment preparedness and response planning, a standard guide for conducting emergency preparedness drills and exercises, and a standard guide for developing model emergency operations plans in response to all-hazard events including CBRNE. DHS will support EML to initiate a cooperative interagency effort to address laboratory emergency response measurement protocol development and laboratory capability and capacity assessment. Work with National Incident Management System (NIMS) Integration Center (NIC) and Urban Search and Rescue (USAR) robotics standards will continue.
- Supported efforts with American Society for Testing and Materials (ASTM) to coordinate the development of a draft standard for hospital preparedness and to develop a multi-disciplinary Mission Essential Task List (METL) based on Emergency Responder Guidelines developed by the Office of Domestic Preparedness. Supported the EML along with the Council of Ionizing Radiation Measurements and Standards (CIRMS) to organize several sessions to gather information on standard operating procedures and method standards that would be used in data collection, sample preparation and analysis, data reduction, as well as data reporting. To address requirements outlined in the National Incident Management System (NIMS), S&T Directorate is supporting an effort to catalog existing incident management standards and identify and address gaps. Initiated an effort with the NIST to develop comprehensive standards related to the development, testing, and certification of effective technologies for sensing, mobility, navigation, planning, integration, and operator interaction within urban search and rescue robotic systems.
- Supported the development of a number of respiratory standards including three National Institute for Occupation Safety and Health (NIOSH) standards and one National Fire Protection Association (NFPA) standard adopted by

DHS in February 2004. The adopted respiratory protection standards address open-circuit Self-Contained Breathing Apparatus (SCBA), CBRN Full Facepiece Air Purifying Respirator (APR), CBRN Air-Purifying Escape Respirator, CBRN Self-Contained Escape Respirator. To date, 50 separate models from six major manufacturers of SCBA have been certified, and two models of APRs have been certified.

- Established ties with the training community including the Center for Domestic Preparedness and local and State organizations. The S&T Directorate has also reached out to determine the necessary requirements and needs for training standards by participating and supporting the ANSI's Homeland Security Standards Panel Subcommittee on Training. Currently establishing the process by which training standards requirements will be compiled and prioritized. In addition, the development of standards to address training to current DHS adopted radiation detector standards is in progress.
- Initiated efforts to supplement those supported by the Wireless Public SAFEty Inter-operable COMmucations (SAFECOM) program. Initiated an effort with NIST to define wireless communications requirements and approaches for urban environments, to develop emergency response operations equipment standards dealing with tactical information from building sensors and systems, wide-band characterization of the dielectric properties of building materials, the definition of wireless ad hoc and personal area networks public safety requirements, and the development of an overall security model for information sharing. These efforts support the integration of communications equipment with protective equipment used during incident response.
- Established the Geospatial Working Group Subcommittee on Standards (with the support of the DHS Geospatial Management Office) to address the adoption of a suite of Geospatial related standards. Work will continue under the auspices of the Geospatial Working Group Subcommittee on Standards. The group will review the compilation of standards recommended for adoption and achieve consensus on the adoption of all relevant Geospatial standards.
- Supported an effort at NIST to work with the American Society of Mechanical Engineers (ASME) to prepare for acceptance a suite of standards and materials for a training course on how to apply the homeland security standards to aid the owners and managers of constructed facilities in the selection of cost-effective strategies for the management of risks associated with terrorist and natural hazards.
- Established the framework for a DHS conformity assessment working group, consisting of experts from DHS, other federal agencies, and the private sector. Other accomplishments include a draft certification program for radiation detectors affected by the DHS adopted ANSI N42 Radiation Detection Standards; the development and deployment of a conformity assessment training module; outreach to the private sector through the ANSI's Homeland Security Standards Panel and the American Council of Independent Laboratories; and the identification of viable private sector laboratory, certification and accreditation resources that have the competence and capacity to perform selected functions.

Emergency Preparedness and Response

- The Interagency Modeling and Atmospheric Assessment Center (IMAAC) is a DHS-led capability that provides a single hazards prediction for airborne release of hazardous material. The IMAAC coordinates federal atmospheric support for "incidents of national significance" and provides hazards predictions to federal, State and local responders. The IMAAC began operation in FY 2004, supporting the National Exercise Program and special events, such as the Democratic and Republican National Conventions. IMAAC has established near-real time connectivity to the Department of Homeland Security Operations Center and the FEMA National Emergency Operations Center.
- Selected four urban areas were selected for the pilot Regional Technology Integration (RTI) initiative. These locations provide an opportunity to evaluate geographic and governance diversity as well as variability in threats and vulnerabilities. An integrated assessment process has been initiated in collaboration with these communities. These assessments will identify key assets, review existing vulnerability and threat assessments, emergency preparedness and response plans with the express purpose of identifying potential technology systems that can help prevent, detect, respond to and recover from terrorist and other major emergencies.

- Leveraged the work initiated by ODP and the Memorial Institute for the Prevention of Terrorism, the National Institute of Justice and the Department of Defense in identifying needs and gaps as well as existing technology development programs that can be utilized for incident management training. Developing a rapid prototype of the Technology Clearinghouse "hub and spoke" concept to enable first responders to access important information on existing and emerging technologies, training, and relevant standards through a single knowledge portal.
- Established an R&D program that seeks materials and technologies that can be used in multi-hazard environments, applicable to diverse users, and function as an integral part of a more complex personal protection system. Focus is on materials that are lighter-weight or likely to impact on weight reduction of the overall personal protective system, that are robust and able to withstand the challenges of strenuous activity in unstable and uncertain conditions (rubble, collapsing structures, flying debris, etc.) and environments (extreme heat or cold, wind, rain, flash fire) and provide protection against a multitude of hazards (industrial chemicals, chemical or biological warfare agents, radiation, shrapnel, flying debris, other).
- Unified Incident Command and Decision Support: The research and development program in UICDS seeks to harness innovative ideas in an effort to create an information management and sharing architecture specifically designed to meet the needs of incident commanders and emergency responders throughout the Nation. It further seeks to realize a robust, fully functional UICDS information management system to enhance the safety and effectiveness of the Nation's emergency responder community. This program will confront the technical challenges associated with the development of innovative, modular, scaleable, and secure information management architecture. Utilizing this systems approach will enable incident commanders to capture important incident-related information, analyze captured information, more effectively disseminate mission critical information to emergency responders, present decision guidance options for incident commanders, more finely coordinate the efforts of emergency responders, and store relevant information for future study.

Border and Transportation Security

- Issued a solicitation for an Advanced Container Security Device to develop and field-test the next generation of shipping container security devices, building on the current efforts through Operation Safe Commerce as well as current BTS policy efforts to develop and implement performance standards for container security. The Advanced Container Security Device Program is part of a "Future Smart Container" initiative encompassing container security, communications, and data systems for the future. The goal is to develop and field-test the next-generation of shipping container security devices that are not currently available in the marketplace.
- Supported BTS in putting technology in the field to support the Arizona Border Control Initiative. The program funded the effort to put Unmanned Aerial Vehicles into operation to support surveillance activities. Demonstrated other technologies such as a long range acoustic device which allows agents to communicate from a safer stand-off distance to determine the intent of people. These opportunities allowed the BTS portfolio to evaluate new technologies that could improve the safety and effectiveness of our border patrol agents.
- Conducted a series of officer and agent workshops to understand the operational environments, functional capabilities needed, and associated goals. In addition, a series of technologist workshops were conducted with federal, industry and academia experts to examine the technologies needed to fill the gaps in capabilities identified during the operators' workshops. Because not all gaps can or will be solved by technology, those gaps that do not lend themselves to technological solutions were referred to BTS management for their information and attention. Added a Scenario Game feature to some of the workshops. The purpose of these scenario-based seminar games was to highlight and validate areas for investment and high pay-off, focus on national impact of technology decisions, examine requirements across components, and analyze the strengths, weaknesses, opportunities and threats of current procedures and technologies.
- Developed a BTS Technology Vision. Together, the elements of this vision—Border Watch, Transportation Watch and Border Net—will significantly im-

prove our ability to provide the information necessary to secure our borders. The foundation of the vision is an architecture and a set of technology programs that will gather, process and distribute real-time knowledge of the border and transportation situation and provide decision support tools and labor saving devices for our security forces.

U.S. Coast Guard

- Integrated a major developmental program, HAKWEYE, into a USCG operational prototype Sector Command Center in South Florida. The HAWKEYE program demonstrates innovative technologies (such as Maritime, Surveillance, Command & Control, Sensor Fusion, and Communications) allowing simultaneous evaluation of technology performance as a direct impact on mission execution. The Operational Assessment of initial equipment installations of HAWKEYE at Ft. Lauderdale, Miami, and Key West will be conducted this year. Focused on the introduction of automated scene understanding and sensor/data fusion technology (a requirement for meeting manning constraints.
- Expedited the operational evaluation deployment of a new application for an underwater imaging device that was in a long-term development program within the Office of Naval Research. The device's development as a small boat mounted underwater inspection device for threats such as improvised explosive devices or parasitic contraband attachments on vessels or piers. The device will allow the Coast Guard or other maritime security interests with the ability to rapidly inspect critical vessels or maritime infrastructure.

U.S. Secret Service

- The Emerging Threats Program supports the Secret Service's continuing, comprehensive assessments of emerging threats and evolving technologies that pose a threat to dignitaries and assets protected by USSS personnel. This effort centers on the annual analysis of the common attack methodologies, strategies and models of operation currently being enacted against assets of a similar nature to those protected by the USSS. This analysis is to be based on open text information without any information as to the defense, mitigation, and protection models being enacted by the USSS.
- The Law Enforcement Virtual-Reality Training Model program supports prototyping and deployment of a law enforcement security-oriented simulation training system for the USSS-specific training and modeling. Additionally, this system will enhance the effectiveness of emergency responders during actual events.
- The Critical Structure Protective Initiative (CSPI) program will ensure continued research and development of network protection systems and procedures designed to mitigate exploitation of site-specific "Very Large Scale Integration" (VLSI) control architectures.
- The Wireless Tracking Device program supports development of a handheld, man-portable wireless tracking device for locating operators of wireless communication device(s) in difficult radio frequency environments such as an office building or event stadium.

Emerging Threats

- Established informal partnerships with the intelligence community and with the USSS portfolio to leverage ongoing activities in support of over-the-horizon assessment.
- Initiated efforts Emerging Threats, in combination with the Rapid Prototyping portfolio, in both near-term and breakthrough solutions to homeland security issues.
- Held a privacy protection workshop in which the technical and policy communities interacted to identify important technical challenges and high impact solution areas. Information from this workshop will form the basis of upcoming programs in this area.
- Analyzed multiple radar technologies and other surveillance strategies to determine which combination of technologies would best support coastal surveillance by the USCG.
- Conducted three sensitive projects, two in collaboration with the USSS and one addressing a critical infrastructure.

- Sponsored studies at the Homeland Security Institute to identify threat and technology trends and develop a framework for analyzing emerging and future threats to homeland security.

Rapid Prototyping

- Solicited ideas, concepts and technologies for 50 requirement areas of interest to both the Department and other agencies. Efforts have been initiated to address chemical and biological threats, explosive detection, training technology tools, improvised nuclear device defeat, and investigative and forensic support topics.
- Developed a joint port and coastal surveillance prototype designated HAWKEYE with the United States Coast Guard (USCG) that provides an integrated maritime surveillance system covering Port Everglades, Miami, and Key West, Florida. This first-of-its-kind integrated command center and maritime surveillance facility opened in July 2004.
- Initiated the implementation of the Technology Clearinghouse as required in the Homeland Security Act of 2002. This clearinghouse serves as the central nexus to the public safety and first responder community on: (1) Information services supporting access to, and dissemination of, information regarding innovative technologies serving the DHS mission; (2) Resources designed to support the collaborative needs of teams serving the mission of DHS; and (3) Technology programs and resources themselves, designed to serve the mission of DHS and distributed via a central DHS mechanism. The clearinghouse will integrate these existing databases though a "hub and spoke" configuration and allow a single point of access to multiple disparate information sources.
- Initiated efforts, in combination with the Emerging Threats portfolio, in both near-term and breakthrough solutions to homeland security issues. Near-term projects are funded out of the Rapid Prototyping Portfolio. Breakthrough projects are funded from the Emerging Threats Portfolio.
- Initiated a program to demonstrate an improved fire fighting protective ensemble and continued its further development. These next-generation garments will provide dramatically enhanced protection against chemical and biological agents while improving the flexibility, weight, durability, heat stress reduction, service life, and costs associated with currently available protective gear.
- Development is underway in the Rapid Prototyping portfolio on technologies that will enable response coordinators to locate, track, monitor, and communicate with emergency responders in structures.

Counter–MANPADS

- Initiated and completed Phase I. In January 2004, following a competitive bidding process, DHS awarded Other Transaction (OT) for Prototype Agreements (OTA) to three companies—BAE Systems, Northrop Grumman, and United Airlines—for Phase I of a two-year System Development and Demonstration (SD&D) effort. During this time, the contractors focused on proving the feasibility of migrating existing DOD technology into the commercial sector and exploring other technology as appropriate. Following Preliminary Design Reviews with all three companies in July 2004, the Phase I portion of the twenty-four month SD&D effort concluded and DHS selected BAE Systems and Northrop Grumman to proceed into Phase II to further mature their preliminary designs, build representative prototypes, install them on aircraft, and conduct formal testing during the Phase II eighteen month effort.
- Involved the commercial aviation stakeholder community beginning in FY 2004 through a widely publicized industry day and a series of one-on-one briefings with key commercial aviation groups and organizations. In late 2004, the Program Office hosted a Stakeholders' Meeting, which was attended by representatives of the airlines, the equipment manufacturers, and other affected sectors, including representatives of multiple Federal Government Departments and Agencies.
- Initiated Phase II of the Program. BAE Systems and Northrop Grumman were selected to proceed into this phase. Phase II of the program includes advancing the studies initiated in Phase I, building system prototypes, applying for and receiving FAA certification of system airworthiness, and effectiveness testing.

Office of Safety Act Implementation

- Drafted regulation, commented upon and implemented. Facilities to house the program were selected and the Office has identified and entered into agreements with the lead implementation contractor and lead web site development/management contactor. The Office designed and implemented a web-based application kit and process with an interactive help desk. The Office executed a robust outreach program to introduce the industry to the SAFETY Act program and to encourage its participation. The Office conducted one-day educational seminars across the U.S. inviting industry, attorneys, risk managers and insurance representatives to participate. Articles and interviews were conducted to further our outreach initiatives. To ensure that pending procurement actions are addressed expeditiously and effectively, the S&T Directorate has created a partnership with federal procurement offices to introduce them to the program; the Office is designing a mechanism that incorporates the SAFETY Act program into the procurement process.
- Received and has taken action on 30 full applications and 120 pre-applications. Four applicants have been awarded SAFETY Act designation and certification: Northrop Grumman, Michael Stapleton Associates, Teledyne Brown Engineering and Lockheed Martin.

Office of Inter-operability and Compatibility

- Interviewed key stakeholders across federal and practitioner communities to validate findings, uncover additional inter-operability initiatives, and determine key issues for first response; identified a core group of federal programs that test and evaluate first responder equipment; began developing a plan to establish a Joint Evaluation and Testing Program to coordinate with other federal agencies; and conducted an initial scan of existing programs for first responders and collected information at the local, State, and federal levels.

University and Fellowship Programs

- Selected the Texas A&M University and its partners from the University of Texas Medical Branch, University of California at Davis, and the University of Southern California to receive $18 million over the course of the next three years for the study of foreign animal and zoonotic diseases. The Center, which will be known as the National Center for Foreign Animal and Zoonotic Disease Defense, will work closely with partners in academia, industry and government to address potential threats to animal agriculture including Foot and Mouth Disease, Rift Valley fever, Avian influenza and Brucellosis. The Foot and Mouth research will be carried out in close collaboration with DHS's Plum Island Animal Disease Center.
- Selected the University of Minnesota and its partners for the National Center for Food Protection and Defense to address agricultural security issues related to post-harvest food protection. The University of Minnesota's team includes partnerships with major food companies as well as other universities, including Michigan State University, University of Wisconsin at Madison, North Dakota State University and others. The Department of Homeland Security expects to provide the University of Minnesota and its partners with $15 million over the course of the next three years to establish best practices and attract new researchers to manage and respond to food contamination events, both intentional and naturally occurring.
- Selected the University of Maryland and its partners as the site for the fourth Center of Excellence on Behavioral and Social Research of Terrorism and Counter-Terrorism. This Center will be funded at $12 million for three years. Support will continue for the three previously awarded DHS Centers as well. All DHS Centers will have a DHS program manager as well as a technical liaison to facilitate linking research and education objectives with the longer range needs of S&T portfolios and DHS operating Directorates. A reporting and assessment procedure will be developed and implemented to ensure effective communication. Explicit plans will be put in place to integrate and complement the activities of the individual Centers with larger scale objectives.
- Announced the selection of the University of Maryland (UMD) and its partners as the Center for Behavioral and Social Research on Terrorism and Counter-Terrorism. This Center will be funded at $12 million for three years.

- Selected approximately100 students for the 2004 class of DHS Scholars and Fellows bringing the total of students to about 200. Students from the 2003 and 2004 class participated in a DHS orientation for the purpose of learning about DHS mission objectives, the critical research needs, and meeting scientists from DHS laboratories, Centers of Excellence and DOE national laboratories. Students from both classes are attending 93 institutions (including Historically Black Colleges and Universities/Minority Serving Institutions) in 38 states and the District of Columbia. Seventeen of the institutions are located in Experienced Programs to Stimulate Competitive Research (EPSCoR) states. Besides making immediate contributions to homeland security-related R&D, these students will be part of the development of a broad research capability within the Nation's universities to address scientific and technological issues related to homeland security.
- As part of the DHS mission to maximize interaction with other federal agencies, University Programs and EPA's Science to Achieve Results (STAR) Program have collaborated on the topic of microbial risk assessment. The DHS-EPA Cooperative Center on Microbial Risk Assessment will result in one five year grant to a university-based consortium that is jointly funded by both agencies at $10 million.

Critical Infrastructure Protection

- Developed a CIP Decision Support System (DSS) focused on prioritizing investment, protection, mitigation, response, and recovery strategies related to Critical Infrastructure Protection. The prototype model includes representation of all 14 critical infrastructure sectors, as outlined in the National Strategy for the Protection of Critical Infrastructures and Key Assets, as well as their interdependencies. Preliminary test cases have been used to develop consequence estimation features of the CIP–DSS at both national and metropolitan scales.
- Identified requirements for standards and research and development for Supervisory Control and Data and Acquisition (SCADA) systems.
- Initiated a system study to find potential solutions for personnel surety for security guards that guard our nation's Critical Infrastructure, as well as insiders with access to sensitive areas of, or information about the infrastructure.
- Began National Research Council studies on the security of the Electrical and Chemical sectors.
- Supported a System Study for Municipal Domestic Water Security, along with the Biological Countermeasures portfolio, Chemical Countermeasures portfolio, and Radiological/Nuclear Countermeasures portfolio.
- Initiated interagency development of the first annual National Critical Infrastructure Protection R&D Plan using the Infrastructure Subcommittee of the National Science and Technology Council.

Cyber Security

- Initiated dialog aimed at international collaboration on cyber security R&D with Canada, the United Kingdom, and Japan. Interactions with the United Kingdom and Japan are at early stages and have not yet reached the point where potential joint R&D activities have been identified. Interactions with Canada are more advanced, with three joint, mutually synergistic U.S.-Canada R&D projects resulting from the interaction: (1) a secure wireless data pilot project, (2) collaborative funding of an economic assessment study, and (3) development of geographic information system-based tools for geospatial mapping of cyber assets.
- Focused on securing the domain name infrastructure is working to advance the diffusion and use of the Domain Name System Security Extensions (DNSSEC) protocol as a replacement for the traditional domain name infrastructure. Worked with federal researchers and officials and the private sector to develop a roadmap to accelerate the development and deployment of a secure domain name infrastructure. Current work also includes the identification of technology requirements and development of models to aid in assessing the performance impact of utilizing DNSSEC in operational environments.

- A second effort aimed at secure routing infrastructure is working to address vulnerabilities in Border Gateway Protocol (BGP), the protocol associated with the Internet's underlying routing infrastructure. This need was also identified as a priority in the *National Strategy to Secure Cyberspace.* Focused on preliminary planning for outyear activities. The development and deployment path for a secure routing protocol is expected be similar to that of DNSSEC, but will reach an equivalent level of maturity some years later, with DHS investments aimed at accelerating this process.
- Initiated a research and development program to fund the development of next-generation cyber security technologies in a variety of topic areas including: (1) Vulnerability prevention, discovery and remediation through software assurance technology, including tools for development and code analysis; (2) Cyber security assessment methods and tools, including the development of metrics, security analysis, development of benchmarks; (3) Security and trustworthiness of information systems, with an emphasis on critical infrastructure sectors and critical information infrastructure systems; (4) Wireless security, including foundation for new wireless-based security mechanisms and services, and security for mobile ad hoc wireless networks; (5) Network attack forensics, focused on Internet Protocol traceback (tracing of data back to its source) and attack traceback; and (6) Technologies to defend against identity theft.
- Development of a security architecture for securing the DETER testbed, initial operation of the initial testbed cluster (a scaled-down version of the final testbed), development of an initial hardware/software design document, and initiation of interconnection of university facilities. Accomplishments for the EMIST framework include development of experimental policies and procedures, calibration experiments, operational Phase I experiments on the scaled-down testbed, and documentation of additional attack scenarios and defense mechanisms.
- Initiated a program to address different facets of the need for improved methods for cyber security assessment and testing, in order to provide a foundation for the long-term goal of economically-informed risk-based cyber security decision-making. Initiated investigations of two important issues. The first is the development of a general model for assessing the economic impact of cyber events and attacks to verify or refute the figures typically publicized (e.g., $38 billion for a single Internet worm attack). The second area of interest is the development of tailored business cases aimed at different types of stakeholder community perspectives (e.g., large enterprises, critical infrastructure sector companies, small businesses, home users, etc.). These activities are aimed at putting better information in the hands of cyber security decision-makers (ranging from policy makers to customers of commercial security technology).
- Development of a trusted access information sharing repository infrastructure for collecting and sharing data sets among trusted partners, and development of a contractual and policy framework for ensuring trust among participants and protection of data sets through the Large-scale Network Data Sets Program.

Appendix B

S&T Directorate Interagency Interactions
Department of Homeland Security
March 2004 to February 2005

International:

The Science & Technology Directorate led the interagency effort to pilot a distributed database architecture to support verification of the identity of international travelers and validity of their travel documents. Primary partners on this effort are DHS, OSTP, DOS, and DOJ.

The S&T Directorate worked with DOS (STAS), USDA, OSTP, NSF to create and support the U.S.–Japan Safe and Secure Society forum.

The Directorate and DOS (OES) jointly created and negotiated the U.S.–U.K. S&T Memorandum of Agreement (MOA). The resulting MOA supports collaboration on Homeland Security research, development, testing, and evaluation between the U.S. and the U.K.

The S&T Directorate has partnered with DOE (Second Line of Defense) and the U.K. to conduct information exchanges regarding development and operational testing of radiation monitors for border security applications.

Biological Countermeasures:

The Science and Technology Directorate participated in the White House led interagency Homeland Security Council (HSC) Biodefense Pathobiologics Collaborating Center. This committee has played a major role in conducting the Biodefense End-to-End Study which then led to HSPD–10, NSPD–33 and is now overseeing the implementation of that HSPD/NSPD. Separate subcommittees of this PCC have addressed Food, Agricultural, and Water Security.

The Science and Technology Directorate enacted Project BioShield was enacted in 2004 as a joint HHS–DHS program to accelerate the development of new medical countermeasures for biological, chemical and radiological/nuclear threats.

The Science and Technology Directorate is a co-chair on the Weapons of Mass Destruction Medical Countermeasures (WMD–MCM) subcommittee. This is a subcommittee under the National Science and Technology Council, and has been providing input on BioShield needs and recommendations. DOD and HHS are the primary partners on this subcommittee.

The Science and Technology Directorate and HHS co-chair an interagency committee to address the Engineered Threat.

The Science and Technology Directorate is developing the National Biosurveillance Integration System (NBIS) to integrate biosurveillance information from interagency partners into a common operating picture and then share that information with federal, State and local partners.

The Science and Technology Directorate leads a partnership with CDC, EPA, and FBI on the deployment of BioWatch, a bioaerosol detection system deployed to many of this nation's cities.

BioNet is a DHS funded, DTRA executed pilot program to integrate civilian and military domestic biodetection and consequence management, using San Diego as a pilot city.

As part of its HSPD–10 responsibility, the Science and Technology Directorate is leading an interagency effort with HHS, DOD, and USPS to develop a National Integrated Biomonitoring System.

The Science and Technology Directorate is a primary participant in the establishment of the National Interagency Biodefense Campus being developed at Ft. Detrick.

The National Bioforensics Analysis Center (NBFAC) is a joint Science and Technology Directorate-FBI program.

The Science and Technology Directorate and USDA have developed an integrated national agrodefense strategy, with especial emphasis on foreign animal disease. The Directorate and USDA also conduct joint research and development programs at the Plum Island Animal Disease Center.

Chemical Countermeasures:

The Science and Technology Directorate participated an interagency effort lead by the Homeland Security Council (HSC) to define the Nation's operational vulnerabilities and gaps in responding to a chemical terrorist attack. Interagency

participants on this effort include DOD, HSC, OMB, HHS, OSTP, NSC, DHS, EPA, VA, USDA, OVP, FBI, DOT, DOL, and TSWG. The interagency working group has completed a draft version of a Chemical End-to-End Assessment that identifies critical gaps and vulnerabilities in the Nation's chemical defense.

The Science and Technology Directorate participated on the Counterproliferation Technology Coordinating Committee Chemical Weapons Working Group with other interagency partners, including DOD, EPA, TSWG, HHS, CIA, and DIA. The CTCC was created to improve the coordination of WMD R&D efforts among government agencies. The CTCC Chemical Weapons Working Group meetings resulted in the development of a document identifying priorities, gaps and overlaps in existing R&D programs.

The Science and Technology Directorate initiated an interagency technical working group focused on the establishment of an Environmental Chemical Laboratory Response Network. Interagency partners in this effort include DOD, EPA, CDC, FBI, CIA, HSC, OSTP, and OVP.

The Science and Technology Directorate is a leading member of a technical working group to establish CSAC. The CSAC will provide the Nation with the scientific basis for awareness of chemical threats and attribution of their use against the American public and involves knowledge management, threat characterization, and forensics. The interagency partners in this effort include DOD, CIA, DIA, and the FBI. Currently, efforts are focused on the development of MOUs between DHS and DOD and DHS and the Intelligence Community.

The Science and Technology Directorate is a member of the Scientific Working Group for Forensic Analysis of Chemical Threats (SWGFACT). Interagency partners participating in SWGFACT include DOD, DOE, FBI, CDC, FDA, and USDA.

The Science and Technology Directorate participated jointly lead an effort with OSTP to develop an interagency report to shape strategy and provide guidance regarding WMD research and development. Agencies involved in this effort include DOD, EPA, TSWG, CDC, FDA, and NIH. This effort resulted in a National Strategy for Chemical Defense that outlined necessary efforts by participating agencies.

Explosives Countermeasures:

The Science and Technology Directorate organized an IED Working Group that has included representatives from DOS, DOT, DOI, DOD, DOJ, DOE, Joint IED Task Force. This meeting allows each agency a forum to discuss their requirements and plans with regard to IEDs. Discussions focus on Science and Technology Department mandates, the IED organization roles and responsibilities, partnerships, resources, operational and technical requirements, plans for FY05 and out years, specific projects, technologies of interest, and outcomes/lessons learned.

The Science and Technology Directorate sponsored a VBIED conference, attended by representatives of the DOS, DOT, DOD (including OSD, OCJCS, USN, USA, USAF, PSEAG, DTRA), DOE, DOJ, FBI, and NIJ. This conference provided a forum to share information on detection approaches with the community and encourage provocative discussions among peers.

The Science and Technology Directorate is sponsoring a suicide bomber conference scheduled for February 2005. The primary focus of this meeting will center on the detection of suicide bombers. Speakers from appropriate government agencies will present information about the technologies, both existing and those in developmental stages, qualified for detecting explosives carried on the person.

The Science and Technology Directorate has worked closely with TSWG and DOD in their efforts to address the explosives threat, including participation in conferences, technical evaluations, program reviews, and site visits.

Radiological/Nuclear Countermeasures:

The Science and Technology Directorate hosted an interagency Technical Exchange Meeting to provide a forum for interagency communication on Radiological and Nuclear Countermeasures research and development.

The Science and Technology Directorate participated in several exchanges with DOE components working the radiological/nuclear area to consolidate efforts.

The Science and Technology Directorate participated on the OSTP Domestic Nuclear Defense Working Group to facilitate the formation of the Domestic Nuclear Defense Office.

The Science and Technology Directorate has a lead role in the establishment of the DNDO. The DNDO is being stood up as a national office that will be comprised of interagency participants. The office will be located within the Department of Homeland Security (DHS), but will be jointly staffed with representatives from DHS, the Department of Energy (DOE), the Department of Defense (DOD), and the Federal Bureau of Investigations (FBI), with coordination between the Department

of Justice (DOJ), the Department of State (DOS), the Intelligence Community (IC), and other departments as needed. Interagency staff will hold principle management positions within the DNDO when it becomes fully operational.

Standards:

The Science and Technology Directorate interfaces with other government agencies to facilitate the development of standards for Homeland Security concerns. The Directorate's interactions with other agencies resulted in several voluntary consensus standards developed in concert with US industry and accredited Standards Development Organizations (SDOs).

The Science and Technology Directorate collaborated with DOD (Army, Navy), DOE (National Labs), USDA, and DOC/ National Institute of Standards and Technology) and developed standards for radiation detectors for radiological & nuclear countermeasures.

The Science and Technology Directorate collaborated with DOC/NIST, HHS/Centers for Disease Control, DOD (Office of the Secretary, Army and Navy), FDA, USDA, EPA and FBI to address detection standards for *Bacillus anthracis* (anthrax). This interagency interface resulted in the development of standards for detection of *Bacillus anthracis* (anthrax).

The Science and Technology Directorate succeeded in developing standards for personal protective equipment for emergency responders through collaborative interagency efforts with DOD (Edgewood and Natick), the DOC/NIST, and HHS/NIOSH (Pittsburgh laboratory).

The Science and Technology Directorate developed standards for biometrics (facial photograph standards) by partnering with DOC/NIST, DOJ/FBI and Department of State.

The Science and Technology Directorate participates on an OSTP/NSTC Subcommittee on Standards that included DHS, National Research Council, Environmental Protection Agency, Department of Energy, Health and Human Services/National Cancer Institute, DOL/Occupational Safety and Health Administration and Department of Defense. This Subcommittee on Standards developed Protective Action Guides to provide federal guidance to emergency responders to a dirty bomb or nuclear.

Border and Transportation Security:

The Science and Technology Directorate regularly interfaces with the Department of Justice personnel and is involved in various National Institute of Justice (NIJ) Office of Science and Technology activities. NIJ convenes a technology review board which enables technology transition. NIJ also has a Southwest Center of Excellence for Public Safety Technology. The Directorate has been involved in the University of Houston's educational workshop which is part of the NIJ Center of Excellence.

The Directorate is also in the process of setting up a formal interface with the Federal Bureau of Investigation. The FBI's R&D director is a newly created position, and the Directorate anticipates meeting to discuss areas of collaboration, technology information exchange, and technology transition.

Over the past two years, the Science and Technology Directorate has coordinated extensively with the Department of Defense and Federal Aviation Administration with respect to Unmanned Aerial Vehicle (UAV) operations and evaluations. Last year, the UAV Executive Steering Group (UAV ESG) was established to advise the Secretary of Homeland Security and provide a forum for communication, coordination and cooperation to address DHS UAV issues. The UAV ESG is made up of representatives from DHS components, the Department of Defense and the Federal Aviation Administration.

The Science and Technology Directorate is a representative on the InfoSec Research Council (IRC). The IRC is an interagency working group that engages in coordination activities at a more technical level than the CIP IWG. The IRC is updating the *InfoSec Hard Problems List*, a report on important information security research challenges that was first published in 1999 and is in need of updating due to the significant advances and evolution in technology in the past five years.

The Science and Technology Directorate and NSF are jointly co-funding the two large multi-university projects that form a Cyber Security Testbed Program and recently co-sponsored a United States-Japan Experts Workshop on Critical Information Infrastructure Protection.

Emergency Preparedness and Response:

The Science and Technology Directorate established the Interagency Modeling and Atmospheric Assessment Center (IMAAC) in April 2004. The IMAAC is currently operational and provides atmospheric hazards predictions for incidents of national significance. Participants include DOD, DOE, EPA, NRC, NOAA, NASA, and DOC.

The IMAAC developed an MOU that establishes general operating principles and provides for the development of annexes which detail the department to agency specific resource commitments. In addition to the MOU the working group has produced an interim Standard Operating Procedure, currently is reviewing the template for annexes, and started discussions on other critical aspects of atmospheric hazard prediction that will improve the coordination of federal assets.

The Science and Technology Directorate participates in the Federal Committee for Meteorological Services and Supporting Research (FCMSSR). This interagency group provides direct policy guidance to the Office of Federal Coordinator for Meteorological Research.

The Science and Technology Directorate participates on the Interdepartmental Committee for Meteorological Services and Supporting Research (ICMSSR) and co-chairs an interagency Joint Action Group as part of this committee. A collaborative process was co-led by the Directorate and the Army Research Office, with participation from DOE, DTRA, Dugway Proving Grounds, EPA NASA, NOAA, and the NRC to focus on modeling of Atmospheric Transport and Dispersion (ATD). The Joint Action Group, as a subset of the ICMSSR, developed an Atmospheric Transport and Diffusion Research and Development Plan that describes the requirements to meet ATD user-community needs. The R&D Plan also recommends strategies to address those needs to achieve reliable ATD modeling capability.

Critical Infrastructure Protection:

The S&T Directorate co-chairs the Infrastructure Subcommittee (ISC) of the National Science and Technology Council (NSTC), and over twenty other government agencies are members of the ISC. The ISC reports directly to two NSTC committees: the Homeland and National Security (co-chaired by the Directorate) and the Technology committees. The ISC developed the first annual 2004 National CIP R&D Plan as well as hosted a Federal CIP R&D Managers Workshop focused on drafting the 2005 National CIP R&D Plan.

The Directorate is co-sponsoring a multi-agency (including non-government) CIP Roundtable with the National Academy of Sciences that will begin meeting in the upcoming year. The roundtable is aimed at addressing the most pressing vulnerabilities associated with critical interdependent infrastructure systems. A dialogue between government, industry, and academia will be established to facilitate development of a long-term strategy for reducing the vulnerability of the Nation's infrastructure to debilitating failures, whether from terrorist acts, natural disasters, or accidental failures.

The Science and Technology Directorate is a member of the DOD Defense Science Board Task Force on Critical Homeland Infrastructure Protection. The Defense Science Board (DSB) on Critical Homeland Infrastructure Protection (CHIP) has concluded their assessment of US Homeland Installations, and is in the process of writing a report on identifying issues for balancing military and private responsibilities for Critical Facility Protection. The report will also address shortfalls and deficiencies associated with operational security, and gaps in security standards.

The Science and Technology Directorate is an ex-officio member of the Government Coordinating Council for Nuclear Power Plants. This Council is one of the entities established by the National Infrastructure Protection Plan (NIPP). In a joint effort, the Nuclear Power Plant and Disposal Facilities Government Coordinating Council (GCC) and Sector Coordinating Council (SCC) is conducting Comprehensive Reviews on all of the Nation's Nuclear Power Plants used for commercial power generation. These reviews include Buffer Zone Protection Plans, Site Security Plans, Nuclear Site Security Annexes, On-Site Emergency Preparedness Plans, Off-Site Emergency Preparedness Plans, and consideration of the general vulnerability to an aircraft as a weapon.

Cyber Security:

The Science and Technology Directorate co-chairs the Critical Information Infrastructure Protection Interagency Working Group (CIIP IWG). The CIIP IWG is chartered by the White House Office of Science and Technology Policy (OSTP) under the National Science and Technology Council (NSTC) and is co-chaired by OSTP. The CIIP IWG has membership from more than twenty organizations in over a dozen departments and agencies, meets monthly, and is developing a coordinated interagency Federal Cyber Security R&D Plan to guide future funding and programmatic decision-making in this area.

BIOGRAPHY FOR CHARLES E. MCQUEARY

Dr. Charles E. McQueary was appointed by President Bush as Under Secretary for Science and Technology of the Department of Homeland Security and confirmed by the U.S. Senate in March of 2003.

Dr. McQueary leads the research and development arm of the Department, utilizing our nation's scientific and technological resources to provide federal, State and local officials with the technology and capabilities to protect the homeland.

Prior to joining Homeland Security, Dr. McQueary served as President, General Dynamics Advanced Technology systems, in Greensboro, N.C. Earlier in his career, Dr. McQueary served as President and Vice President of business units for AT&T, Lucent Technologies, and as a Director for AT&T Bell Laboratories.

In addition to his professional experience, Dr. McQueary has served his community in many leadership roles as Chair of the Board, and Campaign Chair, of the United Way of Greensboro; Member of the Board of Trustees of North Carolina Agricultural and Technical State University; Member of the Guilford Technical Community College President's CEO Advisory Committee; Member of Board of World Trade Center North Carolina; Chair for Action Greensboro Public Education Initiative; and as a Member of the Board of Guilford County Education Network.

Dr. McQueary holds both a Ph.D. in Engineering Mechanics and an M.S. in Mechanical Engineering from the University of Texas, Austin. The University of Texas has named McQueary a Distinguished Engineering Graduate.

DISCUSSION

Chairman BOEHLERT. Thank you very much.

And thank all of you.

Mr. Kassinger, this is not so much a question but an observation. To quote a late, very popular President, "There you go again," I note, once more, that the Manufacturing Extension Partnership is drastically cut in the proposed budget. That, I think, is unacceptable to the Congress on a bipartisan basis. One of the few programs designed to help the small manufacturer improve his processes so it can improve its marketing and improve its employment opportunities. So please carry the message back that we are enamored with the MEP program. We want it to continue, and we will work cooperatively with you to try to convince you that you should be as enthusiastic about it as we are.

Now to Dr. Bement.

I am concerned about education at NSF, as I indicated in my opening statement. My view is that NSF has a unique role in education because of its connections to universities, its peer review process, and its history of running successful education programs, way back to the teacher-training institutes of the 1960s. How do you see NSF's role in education? And why is it being eroded so steadily? Is this a stealth effort to get it out of NSF and over exclusively in the Department of Education? Because if it is, we have detected the effort, and we are going to vigorously oppose it, because we think you do things exceptionally well at NSF. And if we keep doing things the same old way, we will get the same old results where our youngsters in science and math education proficiency just don't measure up to their counterparts around the world.

Dr. BEMENT. Yes, sir. The Administration does support NSF's research in the area of education at every level. And they are working very hard to strengthen those programs. As a matter of fact, even with the reduction in education, there are enormous successes. We have been working with pilot school districts in K–12 education around the country. We will never have enough re-

sources to deal with all of them. But in my visit to El Paso last week, I saw one of these success stories. The NSF has supported them through the systemic initiatives for five years and through the Math and Science program for five years. They are one of the poorest school districts in Texas with a student population of about 85 percent Hispanic students. And——

Chairman BOEHLERT. Excuse me. If I may interrupt, because I have a limited time——

Dr. BEMENT. You want a short answer.

Chairman BOEHLERT. I know about some of your successes, and boy, I applaud those successes. But it is a funny way to show support when we have a reduction of 22 percent below the fiscal year 2004 level. And I know there are some within the Administration, present company, I think, excepted, who want to put everything in science and math education in the Department of Education. Well, that hasn't worked. And this so-called stealth attack is not going to work, if I have anything to say about it. And I am going to get you more resources. Because if we don't do a better job in K–12 in science and math education, all of those Nobel laureates that Secretary Bodman is bragging about, well, they are going to diminish in numbers compared to the Nobel laureates from abroad.

So I want you to carry that message forward.

Dr. BEMENT. Yes, sir.

Chairman BOEHLERT. Okay.

Let me turn to Dr. McQueary, because you and I have been exposed to something that I think is quite important, and that is container security technology. And we have had an opportunity to see some exciting developments, particularly the one company that is developing an end-to-end system for tracking cargo shipments while also detecting attempts to tamper or open containers while in the supply chain.

I know from your testimony that DHS is working on future smart container initiative, encompassing container security, communications, and data systems for the future. Is this a new start for 2006? And how much does DHS intend to spend in the program? And in your view, are we spending enough on this important area of R&D, because we keep hearing about port security and the——

Dr. MCQUEARY. The issue of container security as they come into this country is, obviously, extremely important. The complexity of the job is one, as we know, and all you have to do is go to a port and see the number of containers that are coming in, whether the correct answer is one of having every container have a device on it so that one can know exactly what is in it, about where it came from and so forth, is the correct answer, and have someone monitoring that all of the time, or is there a better solution that lets us know that when a container is packaged, and then we know what is done with it subsequent to that packaging before it gets into this country. Because we are talking if we were to go down the path of having enormous—have a sensor in each and every container, then we are talking about having enormous data information flow and analysis that is required. And I think it is extremely important that we know which approach is the one. The work that we are doing in the science and technology direction is focusing on

two things. One is the sensors themselves, what would be a good sensor. And of course, there is some tremendous work that is going on in RFID tags, and we believe that we are going to see an answer there, and I think we will be able to make a recommendation.

Chairman BOEHLERT. How much is involved in this future smart container initiative?

Dr. MCQUEARY. Sir, I would have to—I don't have that number off the top——

Chairman BOEHLERT. Provide it for the record.

Dr. MCQUEARY. If I could provide it for the record, I would appreciate that.

Chairman BOEHLERT. Okay.

Dr. MCQUEARY. But—and then the other part is the—as I indicated, is how we put all of this information together, because quite frankly, I think the whole issue, for the Department of Homeland Security, of how you collect the information disseminated is one of the largest challenges that we have, a lot more so than just the scientific aspect of it.

Chairman BOEHLERT. Well, when you have this array of talent before you and you have the podium, the advantage of the Chair, my temptation is to just go on and on with my questions, but the red light is on for me. And so I will defer to my distinguished colleague, the Ranking Member, Mr. Gordon of Tennessee.

Mr. GORDON. Thank you, Mr. Chairman. There is a lot to talk about, so let me just quickly concur, Mr. Kassinger, with the MEP program. We all think this is an important productive program for the country.

And Dr. Bement, science education is cut, again, I want to concur, in that science education funding is very important.

Dr. Marburger, throughout your testimony, you sort of factored out, I guess you would say, congressional earmarks to make the figures look better. Let me point out that the entire Administration budget is an earmark. And it would seem that, as an equal partner in government, that the Legislative Branch might have some good ideas, also. For example, as the Chairman pointed out, we would not have a tsunami warning system now if it wasn't for earmarks there. So you know, the equal branch congressional earmarks are very, very small in comparison to the Administration's complete earmark. So I just want to be sure that we understand that.

And Dr. Marburger, you again mention a historic increase in R&D over the course of this Administration and record R&D budgets. And while R&D, as a percent of discretionary spending, is relatively high, in historic terms, the federal R&D as a percent of GDP is near a 50-year low. And while I accept your point that weapons systems development can drive innovation and strengthen economic competitiveness, you, yourself, have stated before this very Committee that the federal R&D budget is an imperfect value for evaluating science and technology funding. Most agree that the S&T budget is a more exact measure of research funding and that decreases by 1.4 percent, or $877 million in the request. But if you want to use R&D, let us use the R&D. The R&D increases by merely, approximately, ½ percent, which is less than the two percent expected rate of inflation. So in real spending power, it is a decrease. Overall, R&D funding for basic research would decrease by 1.2 per-

cent and funding for applied research would decrease by $3 million, again, all less than the two percent inflation.

Now again, Dr. Marburger, I do not mean this as personal criticism. You are dealing with the hand you were dealt, and if you were the dealer, I think that might be, you know, different. So again, this is not personal to you.

Now Dr. Bement, I have got some—I want to go over some things with you. I have got some questions, and I have staff that is going to bring the questions to you—I am going to read them for the record, but so that it will be easier for you, you can have them also.

Dr. Bement, although the budget request shows a 2.7 increase for Research and Related Activities, the actual budget picture is much less positive. Over 40 percent of the increase is an accounting change, or some might say gimmick, for how the Coast Guard is reimbursed for the use of its icebreakers in support of the National Science Foundation's science activities. As the budget presentation points out, the actual increase proposed for research projects is approximately 0.3 percent, which is, as we have pointed out, below inflation.

And so here are some questions concerning the icebreaker, Dr. Bement.

At what level of the Administration was the decision made to give the National Science Foundation responsibility to assume more of the icebreaker operations and maintenance costs in fiscal year 2006? Is NSF the sole user of the Coast Guard icebreakers, or do the icebreakers have other missions? What is the current arrangement for reimbursing the Coast Guard for icebreaker use? And how much did the National Science Foundation spend for this purpose in fiscal year 2004? And how much is projected to be spent in fiscal year 2005? And does the National Science Foundation have an agreement with the Coast Guard on the cost of use of icebreakers in 2006? And is it possible that the reimbursement could exceed the $48 million budgeted? And finally, and I hope all of this can be, you know, crisp, is the National Science Foundation formally obligated to use the Coast Guard icebreaker to meet its needs for fiscal year 2006? Or is the Foundation free to lease foreign icebreakers? And is leasing foreign icebreakers a viable option?

Dr. BEMENT. Thank you for those questions. I will try and be crisp.

The estimated cost for maintaining the Polar Sea and Polar Star, which are near the end of life, is around $70 to $75 million over the next two or three years per year, which greatly exceeds the amount that was provided through this so-called accounting change. The decision to give NSF that responsibility came as a result of several meetings at the White House between OSTP and OMB since the dominant use of the icebreakers is in support of science. But that is not its only use. In the polar treaty it is also expected that the United States will maintain a presence in the Antarctic, which goes beyond the science. And there are other missions for ice breaking, which could include navigation, military support, and so forth.

The current arrangement for reimbursement of the Coast Guard is that we will reimburse for use of the icebreakers for science support.

Mr. GORDON. And that has been determined to be $48 million?

Dr. BEMENT. Well, we are currently in discussion with the Coast Guard to develop an operating plan for fiscal year 2006 that will be within an affordable limit that we can deal with. Those discussions are ongoing. We should have a determination later in the spring, and we can share that with you at that time.

Let us see. As far as obligation to use the Coast Guard icebreakers, yes, by law, we are obliged to use the Coast Guard icebreakers if they can perform a mission. This last year, because the Polar Sea was laid up, and it takes two icebreakers, one in support to free up the lanes for logistics support, we, with their concurrence, also looked at foreign icebreakers that could help support that mission. And it turned out that the only one that was available was the Krasin, which was a Russian icebreaker, and they performed the mission splendidly well.

Mr. GORDON. Thank you for helping enlighten me on this issue.

Chairman BOEHLERT. Thank you very much.

Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman.

I represent a number of high-tech companies, and a particular interest of mine is nanotechnology. And I know all of the witnesses know how important that subject is. My question to Dr. Marburger and Dr. Bement and Mr. Kassinger is this. What is the Federal Government doing in research and development to promote nanotechnology, to integrate it better with other sciences, and to educate the American people about its promise?

Dr. MARBURGER. Let me begin by saying that each of the people at the table here do have a stake in nanotechnology. And I believe at the present time, 13 agencies are involved in the National Nanotechnology Initiative.

My office does provide coordination, a very vigorous interagency working group, and operates the National Nanotechnology Coordinating Office, the NNI Coordinating Office, with a paid executive who ensures that the agencies that have something to contribute to nanotechnology will be involved in the program and active. We are vigorously reaching out, not only to the agencies, but also to the community to understand what their needs are. And it is one of the high salience programs in this Administration.

Mr. SMITH. Thank you.

Dr. Bement, do you have anything to add to that?

Dr. BEMENT. Yes, we have a lead responsibility for the nanoscience initiative, the NNI. And we exercise that in cooperation with the National Science and Technology Council through interagency cooperation, because we are all leveraging off each other. We also have international programs, and we also have industry linkages through SBIR and STTR programs.

We are focused primarily on seven different initiatives through all of these mechanisms. One is fundamental phenomena and processes, research and nanomaterials, nanoscale devices and systems, instrumentation research for nanotechnology, in other words, how do you measure down at the level of a proton, instrumentation re-

search for nanotechnology, nanomanufacturing, and this is where the strong linkages are with industry, major research facilities and instrumentation acquisition and societal dimensions, because we are worried about toxicology concerns. We are worried about public concerns. We don't want that to block the innovation or the eventual migration of new technologies coming out of this field into the marketplace. So we are investing about $44.5 million in that area.

Mr. SMITH. Thank you.

And Mr. Kassinger.

Mr. KASSINGER. Mr. Smith, we also are heavily invested in this area. It is one of the three areas I identified as the priorities in my oral statement, and my written statement has more detailed information. But specifically, in our Advanced Measurement Laboratory, we are proposing $10 million towards the National Nanomanufacturing and Nanometrology facility, which will be a brand new facility to work with in cooperation of industry on these issues. We are putting another $4 million into nanomanufacturing research also in connection with that effort. So it is an important focus of attention for NIST.

Mr. SMITH. Thank you very much.

Dr. McQueary and Dr. Bement, I would like to ask you about cyber security. Obviously, one of the great threats to our homeland security is a breach in our cyber security systems. So what is the government doing to strengthen our cyber security defenses?

Dr. McQueary.

Dr. MCQUEARY. The science and technology organization within the Department of Homeland Security serves as a support role to the National Cyber Security Division, which is located in the IAIP [Information Analysis and Infrastructure Protection] organization. We have requested about $17 million in support of the R&D activity. It focuses in a number of areas. One is in the establishment of a joint laboratory with the National Science Foundation in which we can actually do cyber security technology testing, if you will, because you don't want to do testing out on the open Internet. You want to have something that is confined to be able to do that. We support that activity jointly with them.

And then we are funding some research in the area of the domain name cyber security activities that are going on, too. But we really are in a support role, if I may, because we don't have a charter to go off on our own and independently work that issue.

Mr. SMITH. Thank you.

Dr. Bement.

Dr. BEMENT. Yes. Most of our investment in this area comes through our Computer and Information Science and Engineering [CISE] Directorate, which directly addresses the President's—or the *Cyber Security Research and Development Act.* In addition to the investments by that directorate, other directorates are also contributing to developing robust computing systems, which will eventually make computing systems much more secure. So we track our total investment at about $94 million and the CISE investment at about $69 million, which is a significant increase.

Now that deals not only with secure architectures but secure networks and also robust software and intrusion protection systems.

Mr. SMITH. Thank you.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you.

And this committee is particularly proud of the Cyber Security Research and Development Act and the 21st Century Nanotechnology Research and Development Act. Those are two initiatives from this committee.

There is good news and bad news in this story. I mean, when you are looking at nano, we have increased, more than doubled, funding from 2001 to the present. And that is good news. That is money well spent. And when you look at cyber security, it is sort of flat spending. And Dr. Bement, as we look at your budget, we are excited about certain areas of it, but once again, education takes a hit, and it is down 27 percent for cyber security-focused education programs. That is a cause for some concern.

Dr. BEMENT. I should also mention that under the H1–B Visa account, we are planning to invest about $100 million in not only computer and IT training, but also cybertraining, which will partly offset some of the reductions in cyber security training.

Chairman BOEHLERT. Thank you for that input.

Mr. Costello.

Mr. COSTELLO. Mr. Chairman, thank you.

I would like to join you in welcoming all of our witnesses here today. Mr. Secretary, congratulations on your confirmation, and we look forward to working with you.

I have two questions, two separate topics. One is that I am pleased, and I think the Committee is pleased, that the Administration has again reaffirmed their commitment toward the FutureGen project, the future generation power plant and has called for an $18 million funding level, the same appropriation level as they called for last year. And we are also pleased that the Department of Energy has moved forward with the consortium in order to move the FutureGen project forward. We, of course, in Illinois, believe—there are a number of states that, I believe, are attempting to convince the Department of Energy and the consortium that the FutureGen plant should be built in their state. We believe that Illinois, and in particular, southern Illinois, has all of the necessary components to make this project successful. And regardless of where it is sited, we believe it is a very good project and will help make us become less dependent on OPEC oil and more dependent on natural resources from us.

I wonder if you might give us an update as to where we are with the future generation project and comment about the consortium and a date when we can expect the Department and the consortium to make a decision on site selection.

Secretary BODMAN. Well, first of all, Mr. Costello, your number is accurate in terms of the amount of money, $18 million in this year's budget, and I think it is $260-some-odd million anticipated in the 2007 budget, which will get us well on the way to funding this multi-hundred-million-dollar project. We will be meeting the coalition; this is to be a partnership between public utilities and coal producers with the Federal Government. And so we have been going back and forth with the coalition, and we will—we have scheduled a meeting. I don't have the exact date in my mind, but soon, within the next month or two, I believe. That is my best

guess. And in order to try to reach some conclusion, I think that, frankly, there has been some hesitancy on the part of the coalition to move forward unless there is greater certainty, in terms of the funding. And we, on the other hand, are trying to stage this in a way that matches up with the very stringent budget situation that we find ourselves in.

So we are continuing to work with them. And we do believe in it. We think this is very important.

Mr. COSTELLO. Is it reasonable for anyone to assume that—assuming that progress is made with the coalition, that a decision might be made by the end of the year as to the location of the plant?

Secretary BODMAN. I have only been there two weeks, sir, so I am going to take the fifth on that, if I may. I don't want to give you a date and then be unable to honor it.

Mr. COSTELLO. Sure.

Secretary BODMAN. I would be happy to look into it and give you a better response, you and the other Members of the Committee, if that is of interest to you.

[The information referred to is located in Appendix 2: Additional Material for the Record.]

Mr. COSTELLO. And I would like to do that, Mr. Secretary.

The other point that I would make, it is really not a question, and I know that you have only been there a few weeks, so I won't ask you to make a commitment on this, but I ask you to consider it.

This committee has gone on record supporting external regulation for the ten non-defense civilian labs operated under the jurisdiction of the Department of Energy. My colleague, Mr. Calvert from California, and I have sponsored amendments that have been approved in the past through this committee. And it—every other institution, both in government, education, and in the private sector, is subject to being regulated by external regulation through either the NRC or OSHA. We have repeatedly attempted to get these ten labs, and let me say that there were three deaths that happened last year and 2004 at these labs. We have repeatedly asked the Department of Energy and others to support external regulation. So I would ask you to go back and, as you are organizing your organization in the Department of Energy, to please take a look at external regulation for those civilian labs. And at some point in time, I would like to revisit this with you.

Secretary BODMAN. If I could just respond briefly, sir, and tell you that the safety of the employees of this Department will have my highest level of priority. My two former colleagues on the left, Dr. Bement and Mr. Kassinger, can tell you of my days in the Commerce Department when we all worked together there that that was my highest priority there. It will continue to be in this area. And I will look into the matter related to the regulation. I am aware of your interest in it, sir, and of your having sponsored the amendment. All I can tell you is that we share a common goal, that is to say to have a much higher degree of certainty with respect to the physical safety of all who work in our laboratories, be they contractors, be they federal employees, or be they subcontractors.

Mr. COSTELLO. Well, your concern for worker safety is well known, and I commend you for that and know that that is one of the reasons why I am encouraged that you are the Secretary of the Department now. And I would look forward to working with you on this.

Thank you.

Thank you, Mr. Chairman.

Mr. EHLERS. [Presiding.] Thank you.

As you probably heard, the bells rang, and we are having a vote. We are trying to set up a rotation scheme here, and so I will ask questions next, and hopefully another member will come back from voting and chair by the time I finish.

I really have very few questions. I have lots of complaints. And the point is simply that the funding for science this year is just inadequate. I would recognize the tough budget. I recognize tough times. I recognize the military necessities we have. But we seem to forget the important role that research and education plays in our national defense and also in our national prosperity. One of the first tasks I was assigned when I came to the Congress was to try to develop a statement of national science policy, which really hadn't been done since Vannevar Bush did it in 1945. And we did our best. We produced something which was approved by this committee and the House of Representatives. And we made that point very clearly in there. But as part of the process of writing that report, I tried to find out what the rate of return on our investment in scientific research was. I gave up. I read a number of papers on this. But I can tell you that the estimates of the rate of return on our investment in science range from a low of about 25 percent to a high of 4,000 percent. Now you can take your pick anywhere between there, but the point is simply that putting money into science research and into math and science education is an incredibly good investment for this country. And yet, I think in this budget, we are being very penny-wise and pound-foolish by not putting enough resources into that. And when we ask for some money for the military, "Oh, yes. Of course. Don't you need an extra $5 billion?" without recognizing that the money we are putting into science is likely, for the long-term, much more important for the defense of this Nation than any of the money we are spending this year on the Defense budget.

I guess that would be the end of my sermon but not the end of my complaining. And when I look at the NSF budget in particular, two items stand out. First of all, we are supposed to appreciate the generosity that the National Science Foundation did very well this year compared to most other civilian agencies. And that may be, but when you take the $130 million increase, subtract the $48 million for the icebreakers, we are down to $84 million, and we find out that we are considerably below the fiscal year 2004 expenditures. In other words, you know, this Congress passed a bill saying we should double the funding of the NSF over five years, which means an average 15 percent increase, and yet two years ago, we were spending considerably more on the National Science Foundation than we are proposing to spend next year. That just doesn't make sense. We are going downhill instead of uphill.

When you look at math and science education, a 12.4 percent cut, last year this committee conducted a special hearing on the proposal to take money from the National Science Foundation Math and Science Partnerships and put it in the Department of Education. I would say this committee was unanimously opposed to that proposal and spoke strongly against it. We all assumed it wouldn't happen, and yet in the omnibus bill, it did happen. The National Science Foundation funding for math and science education, which they have done extremely well for very many years, was cut. And in fact, the National Science Foundation was cut $60 million below the previous year's actual expenditures. And that is the first time in over 10 years that the National Science Foundation's spending has been reduced.

I am not blaming you. I am not blaming the Administration. The Congress was complacent in that, and they have to take the responsibility. But to cut it further—and I understand we are increasing the spending for Math and Science Partnerships in the Department of Education. The point is simply these are two different programs of two totally different natures. And somehow thinking that, "Well, we have this program in the Department of Education. We want to beef that up. Let us take money away from the National Science Foundation to do that." And as I told the key members of the White House dealing with this that that is absurd. Just because it has the same name doesn't mean you have to rob money from a program that is doing well and spend it on another program that is also doing well. I mean, if they are both good, why cut one to fund the other?

It is very frustrating to me to recognize the need and incidentally, I have been involved with Mr. Udall, who already went to vote, but he and I are co-chairs of the STEM caucus, STEM education caucus, Science, Technology, Engineering, Mathematics education caucus. I can't believe the response that we have received, both from the members and particularly from industry. We have industry groups literally fighting to get on our Advisory Committee to help us. We have had CEOs of technically-oriented companies coming in to meet with appropriators and beg that they will increase the funding for math and science education, because they simply can not hire employees who can do the job. And we complain a lot about outsourcing jobs to India and China, but what do you expect? They, 15 years ago, recognized what had to be done. They improved their science and math education programs. And so the business is going there, because they are producing good scientists, engineers, mathematicians, and we are not.

As I said, this is more in the nature of a complaint than a question, because I don't think any of you here bear responsibility for the budget that has been put together. I personally called OMB and said, "Please do not use last year's NSF budget as a benchmark for next year. Don't pass the punishment on from year to year." And unfortunately, it didn't happen. We still don't have the funding there. And the cut in the Department of Energy, again, is a very large cut to an organization that does a great deal of good. And if we are not serious about solving our energy problems, which is what the Department of Energy is supposed to do, I don't know

where we are going to be 15 years from now in trying to deal with these problems.

My time has expired. I apologize for unloading on you, but I want to get this on the record. And I hope we can all work together to try to change this, certainly during this coming fiscal year, and undoubtedly for the fiscal year beyond that.

Mr. Lipinski is next, but he has left. And I am the only one, so I am going to declare a recess while I go vote. And Mr. Boehlert, I am sure, will be back soon.

The Committee stands in recess.

[Recess.]

Chairman BOEHLERT. We will start again, and I will take the advantage of being in the chair and continue the questioning until some of my colleagues return.

Dr. Bodman, let us talk about DOE Office of Science. I think there has been consensus inside and outside the government that the physical sciences are underfunded, but the Office of Science, which funds 40 percent of that research continues to fare poorly in Administration budgets. Doctor, you weren't at DOE when the budget was put together, but can you offer us any insight on how to reverse this trend? And if funding remains limited, what would be the priority for the Office, funding existing facilities, starting new facilities, or funding individual researchers? The current budget proposal, in a way, does badly by all three, postponing or killing some new projects, cutting back on the hours of existing projects, and cutting individual researcher grants by about 10 percent. I think you can sense from the tone of the question that, speaking on behalf of the entire Committee, we are big fans of the Office of Science, and we think this is an area that demands more attention. And you being the new guy on the block at DOE, I would like to get some of your insight.

Secretary BODMAN. Well, first, Mr. Chairman, I am very pleased to learn that—or reinforce that the Committee is enthusiastic about the Office of Science. I share that, as I mentioned, in my opening remarks. The Office has prepared what they have called an outlook, the document that describes places in priority, various initiatives that are on the radar screen of the Office of Science. It is, I think, a very particularly well done document. It is not a plan in the sense that it is not a commitment to the funding. And frankly, what was done, under the circumstances that we have been dealing with in terms of the financial support that this Office has generated, is to look at the outlook and to make a determination, particularly for some of the highest and most costly undertakings that we have deferred those, frankly. And just in the sense of trying to provide support for those we believe that we can undertake and not mislead anyone. And so that is what this budget does.

We are enthused about the choices that have been made. We think that great progress can be made. I intend to be a vigorous advocate for this Department as we start the discussions on the 2007 budget. And in subsequent years, I will do my best to be vigorous and hopefully effective. We have great leadership in that office, as I have mentioned during my remarks, and I am very enthusiastic about it.

I might mention, one of the challenges of managing the Energy Department is the fact that a lot of what we do is not known, doesn't seem to get much publicity. I thought the question, for example, on the nanotechnology centers, we have got four new ones that will open up as a consequence of this 2006 budget at our national laboratories. It is, I think, the second largest component of the interagency effort and leading with it, but the questions were directed at three of my colleagues, and I just wanted to put an aura in that we also have a major undertaking in that area——

Chairman BOEHLERT. Well, that is great. And——

Secretary BODMAN.—that combines with theirs.

Chairman BOEHLERT. As I indicated, from 2001 to 2005, it has more and doubled the nano budget, so that is one of the many positives in an otherwise very difficult budget. And let me reiterate to you that we also have great confidence in the leadership of the Office of Science. We would like to see some followership in terms of dollars. And I hope that you—well, I know you are concerned about the trend down rather than up, and I hope you will work with us to reverse that.

Secretary BODMAN. Well, I think it is, as you and I have talked during my days in the Commerce Department, the funding that the health sciences have benefited from, extraordinary growth in support, where the physical sciences have been level to down for many years. And I think this is something that OMB is aware of, and they have got very tough choices to make themselves under the circumstances that we find ourselves in, so this is what we feel is the best tradeoff.

Chairman BOEHLERT. Mr. Kassinger, let me ask you one.

We were enthusiastic with the Administration's immediate response to the tsunami, the devastating loss of lives and property. And we are supportive of the Administration's proposal to expand tsunami detection and warning capabilities to all U.S. coasts, not just the Pacific, but all U.S. coasts: the Atlantic, Caribbean, and the Gulf of Mexico. NOAA's budget request cuts by nearly 50 percent the Tsunami Hazard Mitigation Program. Now in Washington terms, we are not talking about big dollars, from $4.3 million to $2.3 million. This program provides funding for education and outreach activities as well as help local communities with evacuation planning, which we happen to think is quite important. And witnesses at the hearing we had last week stated that these education activities were almost as important as the technology for detection. Why was the program cut in half when NOAA is requesting $9.5 million for new buoys?

Mr. KASSINGER. Well, Mr. Chairman, NOAA is not only requesting $9.5 million into supplemental for new buoys, but another $14 million in the 2006 request to build out the system completely. That amount of money doesn't just go to buoys. It goes for all of the instrumentation, the seismometers that go with that, the other programs to improve community preparedness, including education, also, more money for mapping of where tsunami inundations may occur. I am not sure that it is correct to say that education is more important than the technology we are investing in.

Chairman BOEHLERT. Believe me, you wouldn't get the Chairman of the Science Committee saying that.

With that said, all of our expert witnesses indicated the importance of education almost as important as the development of technology, not on that—on an equal level.

But as we look at the Administration's request, and once again applauding it, immediate and comprehensive, except that it is really petty cash we are talking about. As I looked at the request, the total request, like $37.5 million, it was a little over a million for education. And I remember one of the witnesses telling us a very poignant story that an English family was visiting Thailand, a resort in Thailand. And the tsunami was coming. And a 10-year-old girl stood on the beach and said, "That is a tsunami. We just studied that in school last week." She issued the warning. The parents went to the management of the hotel. They immediately evacuated the beach, and I don't know how you put an estimate on such things, but it is claimed, and this story was widely reported, it is claimed that this action of the 10-year-old saved about 100 lives.

I guess the point is, a million and a half is not very much for education. So while we are not suggesting that we take it out of the money for buoys, and we are not saying write a blank check, but I would hope, as you examine this request, that we can work together and perhaps get some more in there for education and to help communities on our own—in our own country with evacuation plans.

Mr. KASSINGER. We will certainly take a look at that, Mr. Chairman.

Chairman BOEHLERT. Thank you very much. I do appreciate it.

Mr. Honda.

Mr. HONDA. Thank you, Mr. Chairman. And welcome to the panelists.

I have a question—a comment and a question for Mr. Kassinger.

The MEP is a State-federal partnership, and every federal dollar is leveraged by $1 of state funds and $1 in fees for service. And every year, since the Administration has proposed cutting MEP funding, we have asked what consultation have you had with the states. And every year, we get the same response that we will be doing that in the future. So have you had any discussions to date about this year's federal funding level?

Mr. KASSINGER. We have not consulted with the states on this year's funding level, Mr. Honda, because our feeling is, of course, we needed to talk to you first on the Hill. But we will be doing that. Our proposal is to reduce the federal share, but we feel like the amount we proposed will be sufficient to maintain the national system of centers. And the question is, as you, I think, are alluding to, what is the appropriate sharing relationship? How can we help our—work with our partners to find other sources of funding to the extent the states and communities want to do more with these centers? I know of the strong interest in the Committee in this program, as voiced by Chairman Boehlert and Mr. Gordon, and we will continue to work with our partners on the program.

Mr. HONDA. There was a recent study commissioned by the Department of Commerce, and the outcome was something like the small manufacturing market is underserved in terms of assistance with the productivity and performance improvement measures. And given this finding and increasing pressure of global market

competition on small manufacturers, doesn't it feel like we should be increasing the funds rather than cutting them back in order for us to be more economically viable?

Mr. KASSINGER. Well, again, Mr. Honda, we support maintaining the national system of the MEP centers, but in a time of tight budgets, the question is how large the federal share should be of that. If the program is so successful and valuable, we would hope that others would support that with additional money. We will be talking to our federal partners, as we did last year, about other sources of funds within the Federal Government as well.

Mr. HONDA. Okay. And then relative to ATP, and I will change the question slightly from the last couple of years. How seriously are we supposed to take your proposal to terminate the program given that you haven't provided funding to execute this elimination? You would have to reassign or eliminate at least 228 positions. And that cost could be as high as about $20 million to do this. And ATP is expected to fund about $13 million worth of R&D at the NIST labs. So if ATP ceased to exist, it would cost NIST as much as $33 million to pick up that effort. And this would eat up most of the proposed increase for the labs, if I read the budget correctly. So either we are supposed to believe that you really don't want to increase NIST lab funding or that you really are not serious about terminating ATP. Could you explain which it would be?

Mr. KASSINGER. There is a third alternative and that is we are very serious about our proposal to eliminate the ATP program. You are correct that there would be transition costs. We believe those are manageable within the budget. I think it is premature to estimate, or even speculate, about the number of positions that we would have to reduce, for example, or how much intramural funding we would have to reduce.

There are several reasons for this. For example, every year, we know that there are parts of the ATP grants that are terminated, and that leaves money. We don't know how much that will be this year, but history teaches that there will be several million dollars available to contribute to these other transitional costs.

The other point I would like to make is that the increase in labs that we are proposing of nearly 13 percent would be built into the base. That is a permanent commitment by the Administration to build up what we regard as the real core NIST programs. ATP is a program that has had some successes over the year, but it clearly is not a core mission of NIST in these days.

So we think we can manage the transition, and we are very serious about transferring the focus to the core NIST programs.

Mr. HONDA. So it sounds like you will continue it, but it will continue through attrition so that it will hit zero some time in the future.

Mr. KASSINGER. Well, our program—our plan, if Congress agrees with our proposal, would be to wind up the ATP program in 2006, so it won't be an indefinite into the future situation. We believe that we can manage this with our proposed funding.

Mr. HONDA. Since I still have a little bit more time, Secretary Bodman, I am looking at the budget for energy efficiency and renewable energy programs, and I am a little bit puzzled. The Administration is making the long-range Hydrogen Fuel Initiative a

big focus, but as you well know, hydrogen is not an energy source. It is, rather, an energy carrier. And for the initiative to succeed, we are going to have to come up with some way to produce hydrogen in a way that must be sustainable. And so otherwise, we might continue to deal with the greenhouse gas emissions problem. We won't end our dependence on finite fossil fuel supplies. But this budget cuts funding for energy efficiency and renewable energy programs by 11 percent. Dr. Secretary, can you tell me where the hydrogen is going to come from if we don't develop the means to produce it?

Secretary BODMAN. There are a variety of ways of producing hydrogen. One is electrolysis that could be readily carried out in conjunction with nuclear power, one of the initiatives that the Administration has argued for and continues to aspire to is an increased use of nuclear energy, which has the advantage of not producing any carbon dioxide or other oxides of carbon. Electrical energy could be used for the generation of hydrogen. There are also some other higher temperature cycles that have been discussed in connection with the nuclear program that could also lead to the production of hydrogen. And then some of the coal technologies, the FutureGen project in the coal area calls for hydrogen production itself. And so there are a number of other initiatives that would produce hydrogen. You are quite right in characterizing it as an energy carrier. That is what it is. And it has the advantage of producing water as a byproduct, which is something that is quite benign in the environment.

Mr. HONDA. You mention a couple of sources for energy. Are there other——

Chairman BOEHLERT. The gentleman indicated before that you had a little time left, and I noted it was just one second. You are right: there was a little time. And now you are considerably——

Mr. HONDA. Thank you, Mr. Chairman.

Chairman BOEHLERT.—over that, Mr. Honda.

Mr. HONDA. If you don't mind, then, I would like to submit the rest of my questions to the individuals in writing and——

Chairman BOEHLERT. Oh, without——

Mr. HONDA.—I would like a written response.

Chairman BOEHLERT. Without any objection, because as the witnesses know, this committee has a penchant for submitting questions in writing following your testimony. It gives you some time to think about your answers. We would hope for a timely response, which would enable us to do our jobs.

Mr. HONDA. Yes. And one other comment, Mr. Chairman. I appreciate having this hearing, but each one of those gentlemen can provide a sufficient, you know, conversations and questions and I ask for——

Chairman BOEHLERT. Oh, yeah.

Mr. HONDA.—a hearing in and of itself, so maybe some time in the future we could arrange that.

Thank you very much.

Chairman BOEHLERT. Well, I am so glad that you brought up MEP again. I think you got the message, Mr. Kassinger and Dr. Marburger. I mean, look at the whole genesis back in 1988 when we established MEP, we looked at one of the most successful pro-

grams in the history of the Republic, cooperative extension. And that has enabled American agriculture to be the most productive agriculture economy worldwide. And I remember at that time, Dr. Frank Rose was President of Cornell University. Mr. Secretary, you are fond of that great institution. And I said to myself, "Why not something for manufacturers, particularly the small manufacturers, patterned after cooperative extension?" And that is sort of the genesis of the program. But we keep fighting every year with the Administration. I mean, this is not a gift to small manufacturers who desperately need assistance: ⅓ Federal Government, ⅓ State, ⅓ users. I mean, that is a pretty fair arrangement. And if you are—Dr. Marburger, if you are going to cut the program by 60 percent, I don't see how in the hell you can maintain the same national network. Does that mean you are going to eliminate half of the centers? And then what kind of a national network do you have? I mean, this is something, as I think you can sense from my commentary, but from others like Mr. Gordon and Mr. Honda, on both sides, this is one program designed to help the small manufacturers in America. I am sort of tired of seeing so much go beyond our borders. I would like to help those within. But I don't want to give them a gift; I want to give them a helping hand. So can you assure me that we will maintain a national network under the modest request from the Administration?

Dr. MARBURGER. I think Mr. Kassinger's commitment to the program was well characterized in his remarks. There is a question of priorities here. And I think that one of the key decisions that had to be made was to balance the long-term, enormous impact that the work that the NIST core budget supports in research, basic research for new technologies, future technologies versus, admittedly, an immediate, relatively small leverage impact compared to the huge impact of the core budget. That is one of the considerations that I am aware of. But we are not arguing that the program is not valuable. I believe the program is valuable. And we felt that the funding that is in this request is adequate to support it during these times.

Chairman BOEHLERT. Guess what? We don't agree, but that was a very skillful answer from a very professional witness. We do appreciate that, but we are talking long-term, too, and we would like there to be longer term for a lot of the small manufacturers who might no longer be in business absent some input from these MEP centers, which I think are proving very productive. But this conversation will continue.

Thank you very much.

Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much, Mr. Chairman.

Let me note that today's discussion is taking place in the context of a level of deficit spending of $500 billion a year. And that is why we are here. That is why there is some pressure. That is why people are talking about various issues that we are talking about today. But if we didn't have a $500 billion level of deficit spending, it would be a whole different discussion, or at least it should.

When you have these types of economic pressures, I find it a bit disturbing that the discussions that we have had have not centered on what are you doing to cut spending or what are you doing to

cut out the most wasteful or least productive spending that you have had under your jurisdiction. And that doesn't seem to be what has been discussed at all today. In fact, we are discussing why we aren't spending more in certain areas. When I was a speechwriter, people would always come to me. I was a speechwriter for President Reagan for seven years. And then they would come to me and say, "You have got to cut down the length of this speech. And by the way, we want you to include this, this, and this." And it is the same principle. And either we are serious about this $500 billion deficit or we are not.

Let me ask you this, Dr. Marburger. Did you say earlier on that you were going to increase spending for fusion energy?

Dr. MARBURGER. I did not say that we are going to increase spending for fusion energy. I don't have that particular number at my fingertips, but this Administration does support continued progress on nuclear fusion as an energy source in the distant future.

Mr. ROHRABACHER. Maybe you could outline for me the great progress we have had on fusion energy. Quite frankly, I did a study on that a number of years ago and found that it was the least—had the least amount of progress of any of the energy research that was taking place, and it was receiving hundreds of millions of dollars. Maybe somebody could enlighten me as to what has happened in the last few years that justifies changing that opinion.

Dr. MARBURGER. Right. In just a few words, some things have happened in the last few years that justify changing that, and one of them is the development of the instrumentation that permits us to understand—to peer into the interior of these very complex machines and measure the conditions there. Another important breakthrough is the quality and strength of our computing power that allows us to simulate and numerically design devices, these very complex devices, for containing the very high-temperature fusion plasma.

Mr. ROHRABACHER. Well, has there been any——

Dr. MARBURGER. And there have been important advances in the comparison between what we——

Mr. ROHRABACHER. Have we seen any advance in the actual—I mean, the last time I heard it was less than a second blip of fusion reaction. Has there been any greater length than that?

Dr. MARBURGER. It is necessary to build a larger machine to see the physical phenomena that now stand in the way—may stand in the way of future development.

Mr. ROHRABACHER. I am very——

Dr. MARBURGER. That is what ITER is all about.

Mr. ROHRABACHER. I am very interested in that, and if you could—your office or someone else send me something that would show me the progress that we have had. I think it was four or five years ago that we actually analyzed fusion and found it to be——

Dr. MARBURGER. I would be glad to do that in cooperation with the Department of Energy.

Mr. ROHRABACHER. Okay. And Secretary Kassinger, in that same era, when we tried to reduce the budget, we found that one of the things that could really be done at NOAA much cheaper is to actu-

ally charter ships when they need them rather than having a navy. Does NOAA still have a navy all of these years?

Mr. KASSINGER. We do have the NOAA corps, which is—both operates the NOAA—the officer corps, which——

Mr. ROHRABACHER. But do they have—do we have ships and——

Mr. KASSINGER. Yes, we have fisheries research vessels and mapping vessels that they are the officers for. They—you know, we——

Mr. ROHRABACHER. Is there any reason why, if that could be done in the private sector at considerable savings, that we shouldn't be doing that?

Mr. KASSINGER. If that were the proposition, that would be the case, but we have looked at that, and it is not evident that savings are available.

Mr. ROHRABACHER. Well, I can tell you we had hearings on it six or seven years ago, and I remember it was very beneficial.

Mr. KASSINGER. We have contracted out in the last year or so for some oceanographic mapping services.

Mr. ROHRABACHER. Okay. I would suggest that when you are—when we are facing these kind of budget crunches that we need to look at privatization. We need to look at every alternative that we can. And we mentioned the nanotechnology that $45 million was being spent for commercialization of nanotechnology. Is that what you said?

Mr. KASSINGER. Not commercialization, but we are investing in the advanced measurement laboratory at NIST where we are putting that money into facilities that will be joint industry government research facilities.

Mr. ROHRABACHER. People suggest that nanotechnology is going to be incredibly profitable, and it is going to have an incredible impact on our economy, and thus our large corporations will be making big profits with nanotechnology. Have we done anything to build a payback into the system so that the nanotechnology developed by our research projects will, in some way, be paid for by those commercial entities that are using them for profit in the future?

Mr. KASSINGER. The users of the facility contribute to the cost of using the facility.

Mr. ROHRABACHER. Right.

Mr. KASSINGER. We have not—if you are suggesting have we taken an override on, say, patent royalties or something, no, we have not.

Mr. ROHRABACHER. Right. Well, I would suggest that instead of, Mr. Chairman, instead of complaining that the glass is half empty or half full, that we should be looking at ways like that of making sure that the people who benefit from these investments, especially big corporations, will pay in the future for the type of research that is being done. And number two, I would hope that when there is any private sector alternative that is cheaper for us to do, like the NOAA navy, that we should be going in that direction.

And I appreciate you very much.

Chairman BOEHLERT. Thank you very much for your comments.

The gentleman's points are well taken.

I would commend to him for his reading the current issue of Business Week, which has a cover story on nanotechnology, which

gives an exciting forum, the great promise this holds for the future of our economy. And I would further point out that in all of our dialogue with our very distinguished witnesses, we have not mentioned a number of areas that are proposed for reductions, but we have pinpointed those areas that we think it would be wise to consider increases. Because as we have learned from the great revolution of the '90s when we had 10 consecutive years of growth in our economy, everything was going up: more jobs, more opportunity, more exciting products. That was a technology-driven drive upward. And our investment in technology and science and technology paid very handsome dividends for America.

So we are talking about a modest program like the Manufacturing Extension Partnership——

Mr. ROHRABACHER. Mr. Chairman.

Chairman BOEHLERT. Yeah.

Mr. ROHRABACHER. If you would indulge me just one thought, and that is, we talked about cyber security. Obviously, the companies that are going to most benefit from cyber security technology are these big computer companies. Why aren't we making sure—and that was going to be another question that I didn't have time for, why aren't we making sure that those companies are going to have to pay for the research that is going to give them this great profit in this new technology?

Just a thought.

Chairman BOEHLERT. Let me tell you, the greatest beneficiary of advances in cyber security will be the United States Government.

The Chair now recognizes Mr. Matheson.

Mr. MATHESON. Thank you, Mr. Chairman. I do agree with you on MEP, just so you know.

Dr. Bodman, welcome to your new position at the Department of Energy.

I would like to put up a slide, if I could.

[Slide.]

That is a picture of a site near the Colorado River near Moab, Utah. This is a site right now that is controlled by the Department of Energy. And I noticed in the budget, under the line item of acceleration completions, that there is a $20 million increase in this category, which would include projects, such as this site in Moab. By background, this site is a 10.5 million-ton pile of uranium tailings. It is leaking into the Colorado River, where there are over 25 million users downstream.

And if I could put up slide number two.

[Slide.]

Congress passed a law, which the President signed into law, that indicated that this site should be moved, that the tailings pile should be moved to another location within the State of Utah. I will pause a second if people want to read that.

The reason I point this out is that after Congress passed this law saying that it ought to be moved, Congress also asked the National Academy of Sciences to do a study of this site. And the National Academy report indicated the current site is unstable and that the scenario where the Colorado River ultimately would run across the site is a near certainty. And a recently completed U.S. Geological

Survey report verified the findings of the National Academy of Sciences report.

And so it is interesting that right now—we could go back to the first slide again, just so people can see the picture.

[Slide.]

It is interesting right now the Department of Energy is undertaking an environmental impact statement to evaluate what to do to mitigate this problem. And in the environmental impact statement process, the draft that was issued listed, as some of the options, leaving the pile in place, which is in direct contradiction to what Congress said the Department of Energy ought to do. In fact, this draft environmental impact statement that came out from the Department of Energy, didn't list a preferred alternative, which I thought was kind of unusual not to list one, so hope springs eternal that the preferred alternative in the final EIS perhaps will be to move the pile, as Congress has asked that it be done.

But I noticed, as I said, in the budget, an increased amount of money going into that account compared to what had been spent in previous years. And I guess I wanted to ask you if you had a sense of why this account was increased and what impact it would have for fiscal year 2006 on remediation activities at this site. And secondly, I would like to see if you had any sense of why the Department's draft environmental impact statement included options under consideration that are in contradiction with public law passed by the Congress?

Secretary BODMAN. I am familiar, sir, with the existence of the site and the history of it, how it originated, and how it ended up under the care of the Department of Energy. I am aware of that.

Mr. MATHESON. All right.

Secretary BODMAN. I am aware that there is an environmental impact statement being prepared. I can't comment on whatever alternatives were being considered are or are not in agreement with federal law. I can assure you that this Department will not knowingly violate federal law. There may be differences of opinion as to what the law says. I can't——

Mr. MATHESON. I understand.

Secretary BODMAN.—speak to that. And I can tell you that since this is now my responsibility, I will pursue this, as I will every other part of my responsibility, with vigor.

Mr. MATHESON. Well, I appreciate that. I appreciate, with a new person in charge, the opportunity for new vigor to pursue some of these things.

I would also add that an independent study by scientists of the University of Utah has found that the radioactive contamination has gone underneath the river and is approaching the groundwater supply for the town of Moab. Not only the 25 million users downstream face a long-term issue of concern, but there is an immediate issue of concern for the residents living right in the area. And I would encourage you and the folks in the Department to take a look at this draft EIS, and when you publish the final EIS, I would encourage folks to consider what public law said.

And lastly, on that EIS, I would encourage people to look at the overall long-term life cycle cost of the different options, because if we cap it in place, I think there will be a longer cost over time.

There is a higher up-front cost in moving the tailings pile today, but I think there is a higher long-term cost if we leave them in place. And my concern is short-term cost considerations are going to trump the right decision that ought to be made. And that is the message I wanted to deliver to you today.

Secretary BODMAN. Your message has been delivered and received, sir.

Mr. MATHESON. Well, I appreciate that.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you very much. The gentleman's time has expired.

The distinguished Chairman of the Subcommittee on Research, Mr. Inglis.

Mr. INGLIS. Thank you, Mr. Chairman.

You know, it seems to me that in the President's budget, what he is attempting to do is what we all must do. He is attempting to focus on the most needful priorities. Simple spending must give way to thoughtful investing. If it produces a return, invest it. If it doesn't, cut our losses.

Investments in innovation make an awful lot of sense. Our future depends on innovation. And one of the ones that I am particularly excited about that Secretary Bodman mentioned was the President's hydrogen initiative. We have an exciting opportunity in South Carolina involving BMW and Michelin in funding a graduate Department of Engineering at Clemson University that, along with Microsoft and IBM, would partner to create an opportunity to develop smart cars and fuels of the future. BMW has a hydrogen car right now, a direct-burn hydrogen car. If we went to Spartanburg right now, we would see it.

So Mr. Secretary, the question I have for you is when will we be seeing some fuel for that car? And what can we do to hasten that day that we could actually drive it out of the BMW's interim and up to the 300-mile radius that it is about to achieve?

Secretary BODMAN. First, I am pleased to hear that you are as enthusiastic about the prospects for our hydrogen-powered vehicles as I am. Secondly, there are some experimental stations being set up that do provide for hydrogen in limited quantities. I think before a more extensive network is put in place, the effectiveness and the cost effectiveness of the technology has to make some progress. At least that is my preliminary view. I have not gotten into detail on it. I have not looked at the BMW car, and I don't know what its cost might be in terms of if it were in mass production. But as a general matter, these vehicles and the technology involved in them remains very costly. And therefore, there remain doubts as to how rapidly the technology could be moved to the bulk of our population.

We continue to fund efforts at identifying the technical challenges involved in developing fuel cell or hydrogen-powered vehicles, one of which is carrying enough hydrogen. And that is a real challenge to get enough hydrogen on board and how do we store it and how do we do it under pressure conditions that are acceptable in terms of the safety of the occupants of the vehicle. So we are continuing to work on it. I don't have a fixed date for you——

Mr. INGLIS. Right.

Secretary BODMAN.—that I would have any confidence in.

Mr. INGLIS. You know, it is also exciting that at Savannah River Site, which of course is under your jurisdiction, we have a long history of dealing with tritium under pressure and storage issues there. So hopefully we can have some of that expertise apply to this question. And we are very excited about that.

Dr. Bement, you may have answered this question while I was voting in another committee, but the question about whether the change in the education funding is just a function of tight budget times or whether it reflects a policy decision or a different direction that you are taking.

Dr. BEMENT. I think it is some of both, Mr. Inglis. Fist of all, in order to meet the requirements of our priorities, especially in broadening participation, we did shift some funds out of undergraduate education and shifted it in broadening participation, because about ⅔ of that funding is really undergraduate education, not only in research universities, but four-year colleges and community colleges. So the base is much broader than what you might see in a table where you are only looking at one element.

The total investment in broadening participation, if you just look at the programs of congressional interest, would be about $400 million, but if you look at the total investment, including all of the science directorates in the offices, it is more like $597 million. So that is a very large investment in education.

Now to get to the second part of your question, and I want to go back to the question I didn't quite finish with the Chairman, we have school districts that have made phenomenal progress. They know what works, and they know what works because their test scores show that they work. And if I could just refer back to the El Paso School District again, that school district is 85 percent Hispanic, and over the past 10 years, they have closed the gap between the performance, not only at 11th grade, but at 3rd grade, between white students, Hispanic students, and African American students. And they are outperforming almost every other school district in Texas.

So there are lessons. There are best practices. There is knowledge there that can be applied to every school district in the country. So what is necessary now is to propagate that knowledge. And that is what we work with the Department of Education to try and bring about, because the impact that we can have is small, but the impact that they can have by propagating those lessons can be quite large.

Mr. INGLIS. Thank you.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you.

Ms. Jackson Lee.

Ms. JACKSON LEE. Thank you very much, Mr. Chairman.

Might I indicate, as always, my appreciation to the Ranking Member and the Chairman. But with that appreciation goes a concern that each of these representatives really require, for any kind of adequate oversight, separate hearings for each of you. Frankly, I believe the importance of science is such that we don't have enough time to delve into the drastic impact of the President's tax cuts and the growing cost of the war and Medicaid on science. And

I think this budget is an attempt, with a lot of smoke and mirrors, to convince us that we have any credibility in terms of basic research in the science area. And frankly, I believe that we do not have any credibility.

One of my concerns, of course, is the economy and the good work of the MEP program and to find out that this program is being cut in half, which says to me that there is not a serious concern about the importance and the responsibility of the government work with our corporate community in creating jobs.

If I might share with you briefly some numbers, and I know that we will have an opportunity to look fully at the NASA budget forthcoming, but if we were to look at the NASA budget, let me just simply suggest it goes up a mere $537 million, so it is $11 billion. I don't know if there is any opportunity there to do the safety review and oversight that is necessary and provide the resources that I believe is necessary for the safety with the human space shuttle as well as International Space Station. I hope to encourage the leadership of this committee to have a hearing specifically on safety and how much it will cost.

When we look at energy——

Chairman BOEHLERT. Ms. Jackson Lee, we are having a hearing just tomorrow on NASA's budget.

Ms. JACKSON LEE. I am aware of that. I won't pursue that. I thank you so very much, Mr. Chairman.

On the energy research R&D, you are going down $101 million, barely $8 billion, when we have been very much in a discussion about the energy dependence of the United States on international resources. So obviously, we are not concerned, from the R&D perspective, because we have cut that down.

The National Science Foundation, a mere $4 billion in R&D, a $112 million increase. That is a mere shadow of what is needed.

In Homeland Security, one of the big issues for this Administration, a mere increase for federal research and R&D. One of the key issues of Homeland Security, prevention of nuclear attack, has to do with research R&D. And in Commerce, it is a minus $121 million.

So I am not convinced, even with the good will of this committee leadership, that we are doing anything but touching the outskirts of a tragedy, and the tragedy is that we are not interested and committed to basic research R&D and to the sciences.

Let me also mention this, and I appreciate, Dr. Marburger, in your answers, if you would give me this. One renowned president of a renowned Ivy League institution made a public statement about the genetic question of women when it comes to science. We are hoping and praying that he has had a rebirth and understands the egregiousness of any such comment, and I am being kind by not calling the university's name or the president's name of that university who formerly served in an Administration, in a Democratic Administration. And I imagine he has found his way, I hope.

But in that vein, I am looking at the education directorate. The request totals $104 million, or 12 percent, below the fiscal year 2005 appropriations level. And it is continuing to decline. But more importantly, the decrease is comprised of continuing the closeout of the Math and Science Partnership program. It cuts the K–12 teach-

er education and professional development program, cuts undergraduate education programs, and cuts education research and evaluation programs.

How in the heck, if you will, are we serious about—even with wonderful numbers from El Paso, a great city in my state, isolated incident that we are talking about, but we are talking about a commitment to education for K–12 and also college age, and we are in a crisis with respect to math and science scholars, particularly physicists and chemists, who happen to be Hispanic, African Americans, and others. We are in a crisis, as evidenced when we look to the science institutions, including some of the ones that I know, and of course there is no presence of minorities in those, and there is no presence when they come before our committee. And no one comes to our committee, that happens to be a minority, that is testifying on anything of substance because we have not reached that point yet.

So I ask humbly your answers, Dr. Marburger.

Thank you. I yield back.

Chairman BOEHLERT. The gentlelady's time has expired, but we will permit Dr. Marburger an opportunity to respond.

Dr. MARBURGER. Thank you.

Ms. Jackson Lee, I believe that there is more than one way to address the very serious issues that you have raised, and as Dr. Bement has pointed it out, some of the support in areas other than the education part of the National Science Foundation, play a very important role in drawing young people into the sciences and mathematical and technical subjects. I have a feeling that there is funding well beyond the amounts that are in question that is being spent on this critical issue elsewhere in the budget, including in the Department of Education. I think it is a mistake to discount the enormous impact of the potential and existing impact of the Department of Education on the improvement of instruction in math and science in our schools in the K–12 sector.

So this Administration does care about education. It does believe that education is important. It does believe that no child should be left behind, regardless of race or gender, and that it will continue to explore the best ways of accomplishing educational goals and asking Congress for funds to support that and departments that are appropriate to it.

Chairman BOEHLERT. Thank you very much.

Ms. Biggert.

Ms. BIGGERT. Thank you, Mr. Chairman.

I apologize for my running in and out since I am in a markup as well. So I think I can make it through my questions before I am called back there. But I did want to come and congratulate Secretary Bodman on his recent confirmation. I know that this is the third or fourth Committee, I think, that you have appeared before to discuss the President's budget, and I just wanted to know if you are having fun yet.

Secretary BODMAN. I am really enjoying myself, thank you for asking.

Ms. BIGGERT. Good.

No, I am confident that you, as a native of Chicago, will do a great job and look forward to working with you.

Chairman BOEHLERT. Dr. Bodman, could you refresh my memory? What was the Senate vote on your confirmation?

Secretary BODMAN. It was unanimous, sir.

Chairman BOEHLERT. Oh. That says a lot.

Ms. BIGGERT. Okay. And I also wanted to commend Ray Orbach for the superb job that he has done for the Department and especially for the Office of Science. And then also for developing the 20-year facilities plan that cuts across the scientific disciplines, not to mention programs and offices at the DOE to set priorities for all science. And I think this is no small feat and a major accomplishment.

But as the Chairman of the Energy Subcommittee, and as the Chairman sometimes refers to me as the gentlelady from Argonne National Laboratory, I do have a few questions.

And I was disturbed when the fiscal year 2006 budget came out to request only $4 million for the continued research and development of the Rare Isotope Accelerator, or RIA. And it wasn't so much the level of funding that surprised me but—the President requested $4 million in his last three budgets, and we have raised those before, but what really dismayed me the most was to learn that the DOE would not issue a final RFP or complete the site selection process, which would put both the members of Illinois and the members of Michigan out of our misery of what is going to happen with the site. But Congress certainly has provided enough funding in fiscal year 2005 for the DOE to finalize the RFP and complete the site selection process.

Now I know that you are—that this is—you know, you are just here, and but I would like to ask you if, particularly, and I notice that there is going to be new investments in ITER and the advanced scientific computing. Is the Department committed to the construction of RIA, which was ranked—well, tied for third place in among the plant's near-term priorities, in which I think has really progressed further than certainly the number one ITER, which is to be built out of this country, as I understand it. So do you think that this—do you have this commitment, or is it just gone by the wayside?

Secretary BODMAN. First, I am pleased to be here, and I appreciate your introductory remarks.

The assumptions that you list in your questions, you have got all of the right assumptions. It is, in fact, tied for third on the list of the outlook of a paper that was pulled together by Dr. Orbach and his colleagues. Frankly, I view that $4 million as a placeholder. There is not a commitment at this point in time. Given the enormity of the cost, the potential cost of the RIA, which is of order of $1 billion, that as we look out and look at the various financial requirements of running the science program. The judgment was made that, even though it was ranked very highly, given the costliness of it, that at this point in time, we can not say that we are committed to issuing the RFP, causing some of your constituents and those in Michigan and others, presumably, to go through the costly exercise of responding to the RFP when we don't have a commitment that we can write a check on. And so that is the reason that we made that judgment at this point in time.

It is an important initiative. Intellectually, it is an important initiative, and it was one of the very difficult tradeoffs that had to be made that Dr. Marburger referred to in arriving at this budget proposal.

Ms. BIGGERT. Well, putting more money into the ITER, which at their last hearing a year ago, Dr. Orbach said that that would cost $700,000 and there would be—$700 million, sorry. I forgot a few zeros there. There would be no cost increase, and now I see that it is up to over $1 billion, or $1.1 billion, I believe. So that surprises me and then saying that there is not the money for this one. This has gone so far. I would ask, then, if this program were to be resumed, and certainly the participants in competing for this project have put a lot of money into this already, would that final RFP come out without changes, or would all of these people have to start all over again? I mean, that is a hypothetical, I guess, but it still is an important question.

Secretary BODMAN. Oh, I understand.

First of all, in terms of the cost, we have partners in the ITER proposal, that is a group of six countries. The RIA is something that we are going to write—we, the Federal Government, U.S. Government, would write a check on in its totality. So it is a very substantial amount of money. And I don't have a very glib answer for you, ma'am, you know, that would satisfy you. I could just tell you that, at this point in time, we do not have a commitment to go forward with it. And when we look at that and make a scientific judgment of the value of that versus the other things and the amounts of money that are required, we made the difficult choice of not supporting that in this budget.

Ms. BIGGERT. Okay. And I think that is about all I have to ask, but just let me comment. I think that we have worked so hard on the Office of Science and to make sure that people understand how important the physical sciences are, and we have had an increase in the budget and now that has gone down again, and we have worked, I think, so hard with—just to raise the consciousness of our members and how important that is, and I think that we are just seeing that suddenly, you know, the priority is going down again. And I would love to discuss that further with you at some point.

Chairman BOEHLERT. Thank you. The gentlelady's time has expired.

Mr. Miller, for the final question of the day.

Mr. MILLER. Thank you, Mr. Chairman.

First, I do want to join Chairman Boehlert, Mr. Gordon, Mr. Matheson, and probably others in my support for the MEP. My state, North Carolina, has lost many manufacturing jobs. We are looking for small to medium-sized manufacturers to create new jobs, and the MEP programs are very important to them.

Mr. Bodman, we had a hearing last week on CAFE standards, and I asked exactly the same question to those witnesses that Mr. Honda asked you earlier: where is the hydrogen going to come from for the hydrogen fuel cell? You described electrolysis as part of nuclear power and coal. Where does the research into those processes stand, and how are they funded in this budget?

Secretary BODMAN. Those processes are funded in this budget. The FutureGen project, which will produce hydrogen, is funded in this budget.

Mr. MILLER. Is that—is the resourcing to that—and is that research part of the hydrogen funding, or is that separate?

Secretary BODMAN. No, it is a separate line item for FutureGen, and there is a lot of interest in creating more nuclear power in this country and that initiative is in the budget. The 2010 proposal looks to expand the presence of nuclear power throughout the economy. And there is other research as a part of this budget in the nuclear area.

Mr. MILLER. The witnesses last week all said that we needed to find a way to remove—or get hydrogen from renewable fuels, renewable sources of energy. Are you counting nuclear energy as a form of renewable energy?

Secretary BODMAN. No, sir.

Mr. MILLER. Okay.

Secretary BODMAN. There is also an initiative with respect to——

Mr. MILLER. Renewable.

Secretary BODMAN.—renewable, yes.

Mr. MILLER. And how is that funded?

Secretary BODMAN. That is part of the renewable energy——

Mr. MILLER. Well, that was cut, was it not?

Secretary BODMAN. It has been reduced—this component of it remains an important part of it.

Mr. MILLER. All right.

In order to have a practical fuel cell supply of energy, we have got, first, to do the research to make the hydrogen fuel cells practical, cost efficient, and then also do the research and accomplish what we need to do to create the sources of hydrogen available. What is the realistic time horizon for having a significant fuel cell source of energy?

Secretary BODMAN. Fifteen or twenty years.

Mr. MILLER. Okay. You mentioned that the combination of—that hydrogen fuel cells simply produce water, which is a benign—you call it a benign factor in the environment, which I agree with. But what are the environmental effects of the various methods that are used to generate hydrogen? Apparently the current methodology of taking it from fossil fuels is a pretty dirty process.

Secretary BODMAN. You are correct, sir, that often, one overlooks the environmental impact of just what it will cost to create the hydrogen. And so one must be very conscious of that. That is why I mentioned the attractiveness, relative attractiveness of nuclear energy, the relative attractiveness, you have raised the issue of, renewable sources, where we can produce hydrogen without having any potential adverse effects on the environment.

The general sense that I have, sir, is that the most difficult, the most intractable technical problems, the time-consuming problems relate to the creation of an adequate fuel cell electrode that will produce an economic source of energy for an automobile, number one, and number two, the capability of storing hydrogen on board the vehicle. Those have proven to be very difficult achievements. We have gradually made progress. We still have another factor of, I think, three or four in terms of the costs that we must get to, and

that means getting higher electric output for a much less costly electrode. So that is where the problem is going to be and not in getting the hydrogen delivered throughout our economy, in my opinion.

Mr. MILLER. In the last Congress, we had hearings also on the—well, I see my time is expired, and we need to go vote, Mr. Chairman.

Chairman BOEHLERT. Thank you very much.

And that ends a very productive hearing, and I thank all of you for your input, for being so helpful to this committee.

I think it is very obvious to all of you that this committee is very interested in the work you are about. We want to help provide the resources you might need. And contrary to what some have suggested, we are not recommending increases in everything. And contrary to what some others have suggested, it is not a terrible budget. It is a budget that we have got to massage a little to improve, and when all is said and done, we are going to work constructively and cooperatively to do what is best for America.

Thank you very much. This hearing is adjourned.

Mr. GORDON. Mr. Chairman, if I could, please. Eddie Bernice Johnson was here earlier and would like to be able to make a couple of questions for Mr. Bodman as a part of the record.

Chairman BOEHLERT. All right. Thank you. Without objection, so ordered.

The hearing is adjourned.

[Whereupon, at 1:45 p.m., the Committee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by John H. Marburger, III, President's Science Adviser; Director, Office of Science and Technology Policy

Questions submitted by Chairman Sherwood L. Boehlert

Q1. The Administration's Climate Change Research Initiative is focused on providing answers to important climate change research questions in the near term (two to five years). What is the rationale for cutting these activities by $38 million, or 17 percent, while generally maintaining current funding levels for the long-term climate change research questions?

A1. The FY 2006 Budget requests $181 million for the Climate Change Research Initiative, a decrease of $36 million from the FY 2005 enacted level. The decrease is due to changes in NASA's budget, which reflects the re-scoping of the Glory mission to focus solely on instrument development.

Q2. What role will the Office of Science and Technology Policy (OSTP) play in the current negotiations between the U.S. Coast Guard and the National Science Foundation (NSF) over reimbursement for ice-breaking expenses in fiscal year 2006 (FY06)? How will the wider value of U.S. icebreaking capability in the Antarctic—such as enhanced military preparedness, or the geopolitical value of a U.S presence in Antarctic waters—be factored in to these negotiations? What specific ice-breaking-related costs are NSF and the U.S. Coast Guard each obligated by law to support? Please describe OSTP's position and rationale on what flexibility NSF should have to consider alternative ways to get needed ice-breaking capabilities at the South Pole in FY06 and future years.

A2. Cumulative cuts over time to the Coast Guard's icebreaker maintenance funds presented a challenge: adequate funding was not available to repair POLAR SEA after Deep Freeze 2004, and the Coast Guard would not have the funds if POLAR STAR required major repairs after Deep Freeze 2005. In response to this situation, OSTP coordinated a series of interagency meetings during the fall of 2005 to develop a strategy for maintaining the icebreaking capabilities of the U.S. Government. These meetings involved representatives from the National Science Foundation (NSF), the Coast Guard, the National Oceanic and Atmospheric Administration (NOAA), the U.S. Maritime Administration, the U.S. Geological Survey (USGS), the Office of Management and Budget (OMB), the Department of State (DOS), and the Arctic Research Commission.

Our primary goal was to develop a recommendation that would maintain the U.S. Government's current icebreaking capabilities in the mid-term while allowing an orderly process for determining the Nation's future needs to take place. The FY 2006 proposal for funding the Coast Guard icebreakers needs not be—and is not intended to be—a permanent solution. Under our proposal the icebreakers will be maintained until a decision can be made to undertake major rebuilds of the existing vessels—the "service life extension programs"—or to replace the existing vessels with new icebreakers or to find alternative methods of meeting the Nation's mission needs in the Antarctic.

Under a Memorandum of Understanding (MOU) between NSF and the Coast Guard, NSF agreed to reimburse the Coast Guard for its marginal costs of operation, up to a share of average annual costs. Coast Guard data from 1999 to 2004 show that the defense, enforcement and rescue missions combined account for only 1.5 percent of the usage of the POLARs. During the period 1989 to 2004, these non-research missions account for only 3.0 percent of the total usage. In such a case, the marginal costs attributable to NSF come close to equaling the full direct costs of operations incurred by the Coast Guard.

OSTP will continue to coordinate a government-wide analysis of icebreaking needs by the involved agencies. We are tasking DOD and other agencies with carrying out analyses of their peacetime and wartime icebreaking needs in both the Arctic and the Antarctic. We are also aware that Congress requested the National Academy of Science (NAS) carry out a study of national icebreaking needs. NSF is also investigating other options for supporting the United States Antarctic Program (USAP). The Administration will use the results of these studies to provide an informed plan on the most cost-effective method of simultaneously supporting both the needs of the USAP as well as maintaining an appropriately sized U.S. icebreaker fleet.

Questions submitted by Representative Judy Biggert

Q1. Dr. Marburger, where did the Administration draw the line in terms of which projects should proceed, and which ones should be delayed? With respect to the Department of Energy (DOE), it seems like the budget decisions were made in a piecemeal way, on a project-by-project basis, and were based not so much on the merit or benefit of a project, but rather on its price tag. For instance, it would make sense if your office or the Office of Management and Budget (OMB) had put a halt to any project for which the Secretary of Energy had not signed a CD–0, or even a CD–1 (Critical Decision–0 determines mission need). However, that does not appear to be the case. Were there standards or criteria used to determine which big projects would proceed with funding, and which ones should be postponed or delayed because funding was withheld?

A1. The advice and counsel leading up to the recommendations which form the basis of the President's budget are part of an internal deliberative process to which I provide input. Decisions on programs usually take into account advice from external expert panels. With respect to large facilities, I have suggested five priority factors. These are not determinative in any specific case, but provide a general framework for setting priorities. The following description of these factors comes from a presentation I made to a committee of the National Academy of Science.

1. Facilities useful for multiple fields of science

Imaging satellites, supercomputers, synchrotron light sources, high field NMR, ocean research vessels, neutron sources, all have multiple uses. Computing power, in particular, has become an essential tool for investigating through simulation all physical phenomena described by known, highly accurate, physical laws. Higher priority should go to facilities that support a broader range of science.

2. Facilities that enable or exploit major opportunities in science

The Big-Bang mechanism of cosmic evolution turns the entire universe into a high energy physics experiment. The ability to observe manifestations of the early universe opens a new window on studies of the smallest scales of matter. New instrumentation plus powerful computing permits imaging, manipulating, and simulating atomic scale processes. This opens new vistas of nanoscience. Fields of chemistry, physics, and biology are converging at the atomic scale. "Genomics" and "proteomics" are based on these new capabilities. These are examples of unprecedented opportunities that deserve priority consideration.

3. Facilities whose cost and operation can reasonably be shared with other nations

As a matter of policy, it makes sense to share costs internationally on expensive basic discovery-oriented science facilities. In contrast, other kinds of big facilities, such as supercomputers or x-ray sources, produce new knowledge in areas of science relevant to national issues, and these should be developed independently of international collaboration. Science can be well served without duplicating hugely expensive facilities in different countries. Where the science scope is large, and user demand is high, duplication can be justified (e.g., synchrotron light sources, research reactors, satellites, ocean-going vessels, supercomputers).

4. Facilities that empower large communities of scientists

Synchrotron light sources may be the most productive of all large scientific instruments, but telescopes (on Earth or in space), ocean research vessels, and some other obviously "shareable" instruments rank high. New internet-based communication and control concepts can make centralized facilities available to larger numbers of investigators.

5. Facilities that address major national priorities

Biological containment facilities, observation systems for weather and climate, supercomputers for intelligence analysis, and facilities for nuclear weapons stockpile stewardship are required to carry out major functions of government. The priority accorded to such a function transfers to the facilities that support it.

Q2. Since remaining at the forefront of research in the physical sciences is going to require new investments beyond the International Thermonuclear Experimental Reactor and Advanced Scientific Computing at DOE, is the Administration committed to the implementation of the 20-year, Facilities for the Future of Science plan developed by the DOE Office of Science and publicly touted by former Energy Secretary Abraham?

A2. The Administration encourages the development of strategic planning documents, such as the 20-year Facilities Plan, which help to inform the White House Offices, including my office and the Office of Management and Budget, as well as Congress, about the opportunities and the strategic plans of the Agency. The 20-year Facilities Plan represents a good example of the articulation of priorities for future investments in large scientific facilities. Other agencies are encouraged to undertake similar prioritization exercises. However, the 20-year Facilities Plan is a Department of Energy planning document and not a statement of Administration position.

Questions submitted by Representative Bart Gordon

Q1. Since March 2004, the National Institute of Standards and Technology (NIST) has been without a full time director. Although Dr. Hratch Semerjian has done an outstanding job as Acting Director, the fact remains that NIST has been without a full-time Director for almost a year. When does the Administration intend to nominate a new NIST Director?

A1. The position of Director, National Institute of Standards and Technology, has been vacant since November 24, 2004, when Dr. Bement was sworn in as the Director of the National Science Foundation. The Administration has been working actively since that time to identify and nominate a candidate for this position and will announce a nomination as soon as the process is complete.

Q2. Since 2001, we have lost 2.8 million manufacturing jobs. This past December alone we lost another 25,000. The Administration's FY 2004 Manufacturing Extension Program (MEP) Impacts Report says that MEP increased sales by $4 billion and created over 50,000 jobs. (These numbers reflect results from just ¼ of the recipients, so they are very conservative.)

Q2a. What other federal program produces the kind of return on investment that MEP has demonstrated?

A2a. The estimated return on the Federal Government's investment in R&D varies widely. It is clear, however, that this investment has had—and continues to have—a tremendous impact on the Nation's economy. The programs through which these investments are made are spread across numerous departments and agencies, including NIST. According to NIST, between three percent and six percent of the U.S. gross domestic product (GDP) is attributed to measurements and measurement-related operations that rely on NIST for accuracy, reliability, and international recognition. Based on the 2004 GDP of $11.6 trillion, that equates to a range of approximately $350 billion to $700 billion worth of U.S. goods and services. Because of the tremendous impact on the economy of NIST's R&D programs, the Administration continues to place a high priority on the NIST core laboratory programs.

Q2b. Given the performance of MEP and the economic situation in manufacturing, why hasn't the Administration brought forward a budget proposing to expand MEP?

A2b. The Administration's highest priority for NIST is the laboratory research programs, which produce the scientific foundation for new technologies and support measurement and standards activities that help enable the development and commercialization of new and emerging technologies. Through these programs, NIST provides the infrastructure necessary to promote innovation and enhance the productivity and competitiveness of U.S. manufacturers.

Q2c. How many MEP centers will end up being closed under this proposal and where are they located?

A2c. The FY 2006 Budget does not target any centers for closure. NIST is in the process of defining the criteria and the process by which evaluation of centers will be conducted.

Q2d. The FY03 and FY04 requests for MEP were both $13 million; the FY05 request was $39 million; now we get $46.8 million. Can you explain the process whereby the Administration determines the proper funding level for MEP?

A2d. The Fiscal Year 2006 Budget request proposes to fund MEP at $46.8 million, 50 percent of the FY 2005 grant level. This level will enable NIST to maintain its focus on improving the productivity, economic competitiveness, and technological capability of U.S. manufacturers, particularly small manufacturers, through MEP centers. At the same time, the Budget will provide the NIST laboratories with the funding levels necessary to ensure the scientific foundation for new technologies and

maintain support for standards activities that are key to the development and commercialization of new and emerging technologies.

Q3. The Administration has asked to have the Math and Science Partnership transferred to the Department of Education, which has no history of working to forge links between schools and university faculties as called for in the program. You have also sought a 35 percent cut to the K–12 teacher training program—this amounts to cutting the training program in half over the last two budgets.[1] Meanwhile, our students score badly in international science and math tests, and we know that 82 percent of middle school students and 46 percent of high school students have someone teaching them physical sciences who is not considered qualified to teach.

Q3a. Do you have evidence that either the Math and Science Partnership or the K–12 teacher training program at the National Science Foundation (NSF) was failing or mismanaged?

A3a. The consolidation of the Math and Science Partnership (MSP) at the Department of Education reflects a desire to focus the program on integrating evidence-based practices into classroom settings and on implementing research findings already incurred. NSF continues to support current MSP awards (for $60 million in 2006), but otherwise NSF is focusing K–12 investments on supporting cutting-edge educational science programs.

While NSF is preeminent in forging relationships between research and practice, the Department of Education's MSP program has a statutory requirement for departments of engineering, mathematics or sciences to partner with State or local institutions of higher education in using MSP formula funding.

It should be noted that the Administration still favors competition for this program. The FY 2006 request for MSP at the Department of Education of $269 million (a 51 percent increase over FY 2005), includes $120 million for competitive grants to improve math education for low achieving secondary school students.

Q3b. Is there a single improvement that you are aware of that would have a larger impact on student achievement than having well qualified teachers in every classroom?

A3b. Increasing student achievement is a very complex endeavor that requires R&D in numerous domains. The availability of well-qualified teachers is clearly very important. The President's Department of Education budget includes $2.92 billion for Improving Teacher Quality State Grants to help states ensure that all teachers of core academic subjects are highly qualified, as required by the *No Child Left Behind Act of 2002.* The budget also includes $500 million for a new Teacher Incentive Fund, which would provide formula grants to reward effective teachers and create incentives to attract qualified teachers to high-need schools. The new Adjunct Teacher Corps Initiative will provide $40 million in support of drawing on the skills of well-qualified individuals outside the public education system to meet specialized teaching needs in secondary schools. In addition, the President has proposed to extend the Education Department's new teacher loan forgiveness program, enacted for one year as part of the *Taxpayer-Teacher Protection Act of 2004,* that will provide up to $17,500 in student loan forgiveness to highly qualified math, science, and special education teachers serving low-income communities.

Q3c. Is NSF abandoning its historic role in teacher training and professional development? If not, why are teachers and their preparation becoming such a low priority at NSF?

A3c. Education and workforce development continue to be integral to the mission of the NSF. NSF continually considers new education programs that will create the best ways for broadening opportunities and participation—including an emphasis on minority-serving institutions and community colleges, to link these up with major research universities. The FY 2006 Budget will continue NSF's efforts to prepare U.S. students to enter the science and engineering workforce, with funds for 4,600 graduate research fellowships and traineeships. The Graduate Teaching Fellows in the K–12 Education program, which supports fellowships that put graduate students in NSF-supported Science, Technology, Engineering and Mathematics (STEM)

[1] This figure comes from (presumably) the 34.9 percent reduction (over FY05) to the Teacher Development Program in Elementary, Secondary and Informal Education Division at the NSF. (ESIE was cut 22.6 percent.) Funds for Teacher Professional Continuum were reduced by 45 percent. The program will focus on elementary science in FY06. In FY04, TPC received 198 proposals and funded 14 percent. In FY06, 30 new awards will be funded. Request is $33M, down $27.2M from FY05 Current Plan.

disciplines in K–12 classrooms, improves teaching and communication skills while enriching STEM instruction in these schools. With an increase of $100,000, and with support from other NSF Directorates, the program will support approximately 935 graduate fellows in FY 2006.

Q4. A subcommittee of the President's Council of Advisors on Science and Technology (PCAST) is reviewing the federal support for basic, non-classified cyber security research. A preview of the report's findings presented at a PCAST meeting last month included a concern that such funding is inadequate. The report will call for substantial increases in basic cyber security research at NSF, the Department of Homeland Security (DHS) and the Defense Advanced Research Projects Agency (DARPA).

Q4a. Is cyber security research an area that receives emphasis in the annual guidance OSTP gives to the agencies on national R&D needs?

A4a. While not specifically called out in the guidance provided by the joint OSTP/OMB memo that defines Administration S&T priorities, cyber security is an important component of the interagency Networking and Information Technology R&D (NITRD) Program, which is highlighted in the joint priorities memo to agencies. Current cyber security R&D activities of NITRD agencies are reported primarily in the High Confidence Software and Systems (HCSS) and the Large Scale Networking (LSN) components of the NITRD Program. The NITRD Program is currently considering reporting the cyber security R&D activities under a new Cyber Security component of the Program.

Q4b. Are you satisfied that the funding requests for NSF, DARPA and DHS for FY 2006 will provide adequate resources for this purpose?

A4b. The FY 2006 budget requests for NSF, DARPA and DHS are the result of careful prioritization of agency missions and responsibilities. The NSF expects to spend $80 million on cyber security R&D in FY 2006, which will support research grants on long-term fundamental cyber security research and cyber security-related education and training. DARPA's FY 2006 budget request of $84 million in cyber security R&D is targeted at developing cyber security technologies that benefit the military, particularly important in a network-enabled war fighting context. DHS's FY 2006 budget request of $20 million ($17 million after deductions for salary allocations) for cyber security R&D is formulated based on a formal strategic planning process that takes into consideration risks, threats, and vulnerabilities. These and other agency cyber security activities are consistent with agency missions and provide a complementary approach to cyber security R&D.

Q4c. The PCAST subcommittee also found that the federal research effort in cyber security is unfocused and inefficient due to poor coordination and oversight. Do you agree with this finding, and do you believe cyber security R&D should receive greater attention in the planning and coordination of the interagency National Information Technology R&D program?

A4c. The finding by the President's Information Technology Advisory Committee (PITAC) regarding the coordination and oversight of cyber security R&D did not reflect the efforts of the Critical Information Infrastructure Protection interagency working group (CIIP IWG), which first met in November 2003 and has become increasingly active since then. This active coordinating body representing the cyber security R&D efforts of over 20 organizations from a dozen departments and agencies holds monthly coordination meetings, and is currently completing an interagency cyber security R&D plan. PITAC's recommendation that the coordination of cyber security R&D should be conducted under the Networking and Information Technology R&D (NITRD) Program is currently being implemented.

Q5. The National Science and Technology Council established an Education Research Task Group to review current federal education research activities and to make recommendations for strengthening the federal research portfolio.

Q5a. What has this Task Group accomplished thus far and are any recommendations of the Task Group incorporated in the FY 2006 budget request?

A5a. The National Science and Technology Council, Committee on Science, Subcommittee on Education and Workforce Development has established an Education Research Task Group. The objectives of the Task Group are to: a) review and appraise the depth and content of the current federal investment in research on learning and education in Science, Technology, Engineering and Mathematics (STEM) and in evaluation research, K–20; and b) provide recommendations for strengthening the federal research portfolio.

The reports and recommendations of the Task Group will be submitted to the Subcommittee on Education and Workforce Development and to the Committee on Science for review. To date, no recommendations or findings have been forwarded to the Committees or incorporated in the FY 2006 budget request.

The Task Group reports that it has identified the major federal agencies that invest in Science, Technology, Engineering and Mathematics (STEM) education and evaluation research. Using published solicitations and program announcements, the task group reports that it is nearing completion of the following:

1) a database that characterizes the STEM education research programs and portfolios of these agencies by indicating how much was invested in each of these research areas for each program in FY 2003;
2) a grid in which we list the general priorities and objectives that guided these investments;
3) a table spelling out in detail the specific priorities and objectives for every relevant program in each of the major agencies funding STEM education research;
4) a description by each federal agency regarding the various types of research designs, methods, and data-analytic strategies that are considered to be acceptable and/or of particular interest with respect to the conduct of STEM education research projects;
5) a bibliography of 60+ STEM education reports issued by the National Research Council, the National Science Board, or other organizations during the past 5–7 years; and
6) a list of recommendations emanating from the above-mentioned reports that pertain to research-related issues. The working group reports that it is currently working on a mapping of these recommendations onto the priorities and objectives of all research programs, in order to extract issues and concerns raised in these reports that may still require additional study by the research community.

Based on this information, the Task Group will then develop a list of suggestions and recommendations regarding: 1) how the federal agencies might work together to cover gaps and areas of significant under-funding in the current STEM education and evaluation research portfolio, 2) steps that can be taken to interest investigators who study other societal issues to undertake research on education; and 3) strategies for attracting students to the STEM education and evaluation research fields.

A report to include the databases and recommendations will then be produced and vetted through the respective federal agencies and the Education and Workforce Development Subcommittee prior to public release. The draft report is anticipated by June 2005.

Q5b. What is the level of federal funding for education research across agencies in this year's budget and how does it compare to the previous year?

A5b. No crosscut budget analysis for education research in the FY 2006 Budget is available at this time.

The Task Group's charge is to look across federal agencies and examine the programs that include a STEM education research component. The Task Group took a "snapshot" of the investments in STEM Education Research for FY 2003 only (the year the Task Group began). Preliminary summary data of each agency's budget evaluated by the Task Group indicate that NSF funded nearly $140 million in STEM education research studies, the Department of Education funded over $28 million (though much of this funding wasn't specifically allocated to STEM issues), and The National Institutes of Health (National Institute of Child Health and Human Development, NICHD) funded nearly $6 million.

However, it should be noted that the 2006 Budget includes $479 million for the Department of Education's Institute of Education Sciences. The Institute invests some of these funds in new research programs, including focused programs to identify effective approaches to mathematics and science education, to understand how to enhance children's reading comprehension and to intervene with struggling readers, to identify which preschool programs best prepare children to learn to read and do mathematics, and to determine how to improve the preparation and professional development of teachers of reading and mathematics. In addition, the Institute launched a major program to fund university-based interdisciplinary training programs in the education sciences to train a new generation of scientists who are capable of linking rigorous research to the needs of education decision-makers.

It is important also to note that education research activities are supported throughout the NSF, not only in the Education and Human Resources (EHR) Direc-

torate. The Science of Learning Centers, funded within Research and Related Activities (R&RA) at $23 million, (a $3.16 million increase), support multi-disciplinary research to advance fundamental knowledge in the science of learning. NSF continues to support its Science and Technology Centers with an increase of $2 million to support two Centers initiated in FY 2005—these Centers foster partnerships that build collaborative culture among researchers and education, and create team environments for learning and research.

The NICHD supports research relevant to education via its Early Learning and School Readiness Program, which focuses on research that attempts to specify the experiences children need from birth to age eight to prepare them to learn, read, and succeed in school. The NICHD research program in learning disabilities and reading disorders is now entering its 39th year; the program has increased from one to 44 research sites, and findings obtained from these sites now serve as the scientific basis for evidence-based reading practices and policies in the United States.

In 2002, the NICHD established its mathematics and science learning program to improve understanding of normal and atypical development of mathematical and scientific thinking and learning. In FY 2005, the NICHD, in collaboration with the Administration for Children and Families (U.S. Department of Health and Human Services) and the Office and Special Education and Rehabilitative Services (U.S. Department of Education) supported the development of tools to measure school readiness outcomes for young children. This initiative was directed at providing appropriate measures for linguistically and culturally diverse populations of young children as well as those with disabilities.

Q5c. What is the relationship between the National Science and Technology Council review and the proposed cut of 42 percent to education research in NSF's education directorate?[2]

A5c. The Education Research Task Group has not yet made recommendations to its parent subcommittees (Subcommittee on Education and Workforce Development) of the NSTC, so the work of the Task Group did not play a role in funding decisions for NSF's education directorate.

Q5d. Why is the Interagency Education Research Initiative involving NSF, the National Institutes of Health and the Department of Education being phased out, and again is this an outcome of the National Science and Technology Council review?

A5d. As I explained earlier, the Education Research Task Group has not yet made recommendations to its parent subcommittees (Subcommittee on Education and Workforce Development) of the NSTC, so the work of the Task Group did not play a role in decisions regarding the Interagency Education Research initiative (IERI).

The Department of Education reports that the Interagency Education Research Initiative not been "phased out." The participating agencies decided that it would be better to support the scale-up projects that were the focus of IERI through their own agency's competitive procedures.

In FY 2003, the Institute of Education Sciences (IES) funded its own IERI projects pursuant to a competition specifically and solely for IERI projects that was managed on behalf of NSF, NICHD and the Department of Education. This was the last competition dedicated exclusively to IERI projects. However, in FY 2004, IES invited applicants under their reading comprehension, math and science, and teacher quality research competitions to submit applications that addressed the IERI goal. Those competitions included other research goals that could be addressed by applicants as well. Some of the awards made in FY 2004 and FY 2005 addressed the IERI goal, and similar opportunities will be available in FY 2006. Both NSF and NIH continue to provide research support in these areas.

The NSF portion of IERI held its own competitions in FY 2003 and FY 2004 (with a final competition expected in 2005), because NSF believes that more projects are needed that focus specifically on mathematics and science. In addition, NSF's Research on Learning and Education (ROLE) program supports fundamental research on teaching and learning.

Q6. The Federal Oceanographic Facilities Committee's December 2001 report forecast the need for the addition of ten new ships over a 20-year period to the aging academic research fleet in order to maintain the current fleet capacity. Little has been done to put in place a plan for ship replacement, while we have seen growth in the need for ship time to support ocean observatories and to deploy

[2] Presumably, this refers to the 43.2 percent decrease in Research, Evaluation and Communication in EHR.

and service the tsunamis alert system. Is this matter on the OSTP radar screen, and if so, how is it being addressed in the FY 2006 budget request? Is OSTP involved in any effort to develop a long-term plan for research ship replacement?

A6. The federal oceanographic fleet renewal activity includes: a global-class seismic research ship in FY 2006; four ocean-class fishing survey vessels, with one built and operational in FY 2005, two under construction, and one proposed for funding; four ocean-class ships planned; and, three regional-class ships planned. OSTP, through its participation in the National Oceanographic Partnership Program and through the President's Ocean Action Plan (OAP), is cognizant of the aging oceanographic research fleet. OSTP, through its leadership of the National Science and Technology Council and of OAP, is preparing an ocean research priorities plan and implementation strategy, which will be completed on December 31, 2006, and which will state the Nation's vision for the oceans.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Samuel W. Bodman, Secretary of Energy, U.S. Department of Energy

Questions submitted by Chairman Sherwood L. Boehlert

Q1. Your budget request proposes to phase out funding for oil and gas technology research and development (R&D), stating that "Budget discipline necessitated close scrutiny of all Fossil Energy programs, using strict guidelines to determine their effectiveness and compare them to other programs offering more clearly demonstrated and substantial benefits." What guidelines did the Department of Energy (DOE) use to evaluate program effectiveness, and why did these programs fare poorly? Can the oil and gas industries support this research on their own?

A1. The Administration's decision to terminate the oil and gas research programs reflects a strategic assessment of the program compared to other Fossil Energy programs. The assessment relied on guidelines to evaluate the oil and gas programs' effectiveness, efficiency and technical viability. Much of the Department's oil and natural gas research is jointly funded by industry and the government. In this case it was determined that the industry has the capacity to pursue this research, especially in light of the current strong economic performance of the industry. This is in line with our commitment to deliver results for the American taxpayer.

Q2. According to the National Academy of Sciences, significant reductions in oil use from a transition to hydrogen are at least one or two decades away. How does your budget proposal treat R&D efforts that more focused on near-terms results, such as research on lightweight, high-strength automotive materials, hybrid vehicles and advanced diesels? How can DOE do a better job of encouraging the adoption of these energy-saving technologies into the marketplace?

A2. The Department strongly supports nearer-term and mid-term approaches to reducing our dependence on foreign oil. In fact, almost all of the proposed FY 2006 activities in our Vehicle Technologies Program contribute to nearer-term and mid-term solutions, including $48.8 million for hybrid and electric propulsion, $41.1 million for advanced combustion engines (including diesels), $38.2 million for advanced materials technologies, $13.6 million for advanced fuels development, $13.8 million for vehicle systems, and $5.0 million to support alternative fuel use in fleets.

The Vehicle Technologies Program works through two major government-industry partnerships, the FreedomCAR and Fuel Partnership and the 21st Century Truck Partnership. Partnering with industry creates a common understanding of technical capabilities and barriers, which increases the likelihood that industry will pick up DOE's energy-saving technologies. The Vehicle Technologies Program undertakes efforts to encourage the use of alternative fuel vehicles and alternative fuels in federal, State, local and provider fleets. DOE also provides extensive information for consumers and fleet owners on already commercialized energy efficient transportation technologies on *www.fueleconomy.gov* and *www.eere.energy.gov/vehiclesandfuels.*

ITER

Q3. In last year's budget hearing, the Administration witness assured the committee that the U.S. share of ITER, the international fusion project, would not exceed $700 million dollars. This year's Congressional Budget request puts the U.S. share at over $1.1 billion dollars. Has the Administration withdrawn its commitment? If not, please explain the discrepancy.

A3. The Administration's commitment to ITER remains strong. The $700 million figure to which you refer was a very preliminary figure derived from an estimate prepared by the ITER Parties in July 2001 when the U.S. was not involved in ITER. Their estimate was $5 billion for the total project construction in constant 2002 dollars, so a U.S. 10 percent share would be $500 million. To this $500 million number, DOE added contingency and escalation to reach approximately the $700 million figure. However, based upon continuing U.S. participation in the ITER negotiations, it has become clear that other elements of a typical DOE project cost estimate, such as U.S. industrial input, project management of U.S. procurements, exchange rate effects for personnel sent abroad, and additional R&D and design needed to be included. These items have been included in the FY 2006 President's budget. The detailed current understanding of the ITER "construction" costs are summarized in the President's FY 2006 budget proposal, namely:

The current estimated cost for the U.S. Contributions to ITER project begins with the nominal $502 million dollar value estimate from the international estimate in the *Final Design Report of 2001.* Since then, as is customary for DOE Major Items of Equipment projects, we added 1) $95 million reflecting the actual cost of producing in U.S. industry the components included in our 10 percent portion of the facility, 2) $35 million to the personnel costs reflecting our experience in the previous ITER Engineering Design Activities, and 3) $103 million for project and procurement management. With this base cost for the components, personnel and cash contributions, we needed to add $120 million to cover contingency, $183 million to account for escalation over the years of the project, and $84 million to provide for remaining design and R&D incorporated into the Total Project Cost. With these additions, the nominal $502 million value becomes, in the DOE project management costing system, a total of $1.122 billion.

It is also important to note that the FY 2006 President's Budget also says that this Total Project Cost of $1.122 billion is a preliminary estimate that may well change (due to changes in OMB's outyear inflation estimates and/or currency exchange rates) by the time the project receives its formal performance baseline (known in Critical Decision–2 in the parlance of DOE project management) following the signing of a final multilateral agreement.

Q4. What, in your view, is the most effective strategy for the Department to bridge the remaining gap from the laboratory to the commercial grid in the area of high temperature superconductivity? What can be done to ensure there are demonstrations of complete, integrated systems based on superconducting technology?

A4. The FY 2006 Budget request supports two parallel paths in order to bridge this gap. We are continuing research that improves the performance and potential cost of future high temperature superconductivity grid equipment. At the same time, in partnership with electric utilities and equipment manufacturers, we are supporting demonstrations of first-of-a-kind equipment prototypes in operation on the grid. The time to market will be accelerated by this approach which provides utilities direct experience with installation and operation of superconducting equipment as well as gaining the advantages of their collaboration in designing equipment which will meet their needs and requirements. For example, three complete, integrated systems that demonstrate different aspects of superconducting cables are now being developed in partnership with American Electric Power, Long Island Power Authority and National Grid (Niagara Mohawk) for planned operation and testing on electric grids in Ohio and New York.

Questions submitted by Representative Judy Biggert

RIA Project

Q1. The other projects ahead of or tied with the proposed Rare Isotope Accelerator (RIA) on the 20-year facilities plan would cost the U.S. Government less than RIA (with the possible exception of ITER which was supposed to cost less, but which the FY06 budget says will cost more). That being the case, did DOE suspend the final request for proposals and delay indefinitely the site selection process for RIA only because of money—namely the total project cost and a lack of funding in the FY06 budget and in the outyears? Or were there other considerations, and if so, what were they? Is there no room in the budget for RIA because ITER has become a billion dollar project?

A1. Before proceeding with a project like RIA that requires a significant investment by the U.S. Government, the funding to construct and operate the proposed facility needs to be identified and the decision to proceed must be made in the context of other departmental and national needs and priorities. Under the FY 2006 request, necessary research and development work will continue on the RIA project.

The ITER project has been identified by the President as an Administration priority and funding is requested in FY 2006 to start this project. The detailed estimate of the ITER "construction" costs (in full DOE project management accounting terms) are summarized in the President's FY 2006 Budget. The total project cost includes all costs associated with a Major Item of Equipment project, namely, fabrication of components, personnel and cash contributions to the ITER Organization, contingency, escalation, project and procurement management, and remaining design and R&D.

Office of Science Projects

Q2. Where did the Administration draw the line in terms of which projects should proceed, and which ones should be delayed? With respect to DOE, it seems like the budget decisions were made in a piecemeal way, on a project-by-project basis, and were based not so much on the merit or benefit of a project, but rather on its price tag. For instance, it would make sense if your office or the Office of Management and Budget (OMB) had put a halt to any project for which the Secretary of Energy had not signed a CD–0, or even a CD–1 (Critical Decision–0 determines mission need). However, that does not appear to be the case. Were there standards or criteria used to determine which big projects would proceed with funding, and which ones should be postponed or delayed because funding was withheld?

A2. For all Office of Science projects, the budget decisions were guided by our Facilities Outlook, "Facilities for the Future of Science: A Twenty Year Outlook." In our FY 2006 request, the top priority in the Facilities Outlook, ITER, is funded as U.S. contributions to this international project begin. The next priority, the Ultrascale Scientific Computing Capability, or Next Generation Architecture, was funded in FY 2005 and continues in FY 2006. One of the projects tied for third place in the facilities outlook, the Linac Coherent Light Source, continues design funding started in FY 2005 and also begins physical construction funding in FY 2006. Of the remaining priorities only the Transmission Electronic Achromatic Microscope, a relatively small project with a total project cost range of $25,000,000 to $30,000,000 is funded in our FY 2006 request beyond the R&D stage.

All Office of Science projects included in the FY 2006 request to Congress have CD–0 approval except ITER. CD–1, approval of preliminary baseline range, is required before funding appropriated for a project can be used, but not before the funding request is made.

Question submitted by Representative Dave G. Reichert

Volpentest HAMMER Training and Education Center

Q1. I was recently briefed on the Volpentest HAMMER Training and Education Center in Richland, WA, which provides hands-on "Training as Real as It Gets" that is keeping Hanford cleanup workers safe and healthy, and is helping fire, law enforcement, customs, border protection, security, emergency medical, and other emergency response personnel prepare for the many hazards they face daily in protecting the homeland. Also, HAMMER is helping the Pacific Northwest National Laboratory field test and deploy new technologies to keep workers safe and healthy, and the homeland secure.

Will DOE coordinate with the Department of Homeland Security and other governmental agencies to develop a strategy and a cooperative agreement to ensure that the Volpentest HAMMER Training and Education Center in Richland, WA, remains available to meet the training needs of Hanford cleanup workers, emergency responders, and law enforcement, customs, border protection, and security personnel, along with serving as a test bed to deploy new field technologies?

A1. Yes, DOE will cooperate with the Department of Homeland Security (DHS) to develop a strategy and a cooperative agreement to ensure that the Volpentest Hazardous Materials Management and Emergency Response Training Center (HAMMER) remains available to meet DHS's growing training needs, along with serving as a test bed to deploy new field technologies. DOE supports the expansion of HAMMER customer base. Hanford site workers continue to take advantage of this asset, and the training they are receiving is helping to ensure work is conducted safely and protective of their health and the environment. We also continue to support the transition of HAMMER to future program sponsors. We want to ensure that HAMMER, as a national asset, continues to serve this country's needs now and in the future, beyond the Hanford clean-up mission.

Question submitted by Representative Michael E. Sodrel

Q1. As the United States invests in energy research and development, does the Department have in place programs to assist firms in preventing the exploration of this research through industrial espionage or other means?

A1. The Department's Office of Counterintelligence (OCI) supports a number of programs that are designed to identify, deter and neutralize attempts by foreign powers and their agents to steal classified, proprietary, and other sensitive information and technology related to energy research and development.

One primary OCI effort to address this concern is through a very strong counterintelligence (CI) awareness program that addresses economic espionage and related risks to research and development activity for the DOE/NNSA population. This effort utilizes high-level guest speakers, awareness seminars provided by its CI Training Academy, and mutual support through other U.S. Intelligence Community members to identify potential economic espionage threats to the many DOE/NNSA sites and labs. The CI Training Academy provides an awareness seminar, "Economic Espionage: Protecting Intellectual Property," through mobile training teams for DOE/NNSA employees and contractor staff. The seminar is designed to increase the awareness of the threat to intellectual property, the vulnerabilities associated with that threat, the risks of scientific interaction (collaboration), and the measures each employee must take to protect our trade secrets.

Individual CI offices at DOE/NNSA sites and labs provide pertinent information to assist employees in recognizing the potential threat of economic espionage. Many of these sites have identified key staff that deal with technology transfer and other sensitive research activities for specialized briefings on economic espionage and intelligence activity targeting our research. This subject is also addressed in periodic general CI awareness briefings, and other focused briefings and tailored presentations, which at times address specific identified activities. For example, during late 2004, the Oak Ridge National Laboratory CI Office hosted the Unit Chief of the Economic Espionage Unit from FBI Headquarters who tailored the message to the scientists and other key staff at the laboratory.

As you are aware, an important Departmental vehicle for research and development is the Department's Cooperative Research and Development Agreement (CRADA). This important vehicle allows joint research between laboratories and private corporations on commercially viable technologies at the national laboratories, and is often accomplished in collaboration with scientists and researchers who are foreign nationals from non-Departmental facilities, some of whom are in foreign countries. While U.S. corporations are the preferred partners, foreign corporations may participate in CRADAs.

In order to protect CRADAs, including those related to the field of energy, various CI policies and programs have been implemented. On April 9, 2004, a memorandum entitled, "Guidance to the Field Concerning Support to CRADA," was distributed to all CI offices throughout the DOE complex. The CI offices were directed to take action to coordinate with the appropriate laboratory support elements that are involved with CRADAs to identify at-risk technologies, and develop CI support plans. The CI support plans are required to include threat assessments, CI awareness activities, and the conduct of briefings and debriefings and other pro-active investigative activities.

DOE has issued policy and requirements on unclassified foreign visits and assignments which state that sensitive technology is not to be accessed by foreign nationals, including permanent resident aliens, without proper authorization. The OCI actively supports this program through the coordination of indices checks with the Federal Bureau of Investigation and the Central Intelligence Agency, and the conduct of various investigative activities such as briefings and debriefings.

DOE maintains a sensitive technologies list, which is distributed throughout the DOE complex by OCI and is made part of its Awareness Program.

OCI supports the FBI in its various investigative activities which are responsible for enforcing the laws pertaining to the Economic Espionage Act of 1996 (18 USC 1831 et seq.), and the disclosure of classified and sensitive technology to foreign countries or terrorist groups.

Questions submitted by Representative Bart Gordon

Leadership Class High-End Computing

Q1. We all applauded the Department and Oak Ridge National Laboratory's progress in Leadership Class high-end computing and we look forward to the valuable science research results that the Cray X–1 and Red Storm machines will produce. Can you explain how a $25 million cut to the Center for Computational Science at Oak Ridge will affect the implementation of plans for the Leadership Class machines?

A1. The $25 million budget for the Oak Ridge National Laboratory Leadership Class Computing effort will enable researchers to operate a 20 teraflop Cray X1e and a 20 teraflop Cray XT3 (better known as Red Storm) computer as leadership class resources for open science. These computers will be allocated through an open process to a small number of teams that are positioned to deliver new science on these platforms. This multiple machine approach was what ORNL proposed and what won the competition in FY 2004. The two systems will be the largest systems of their type available to the open scientific community in the U.S. They will provide more science than one large system because some applications, such as plasma physics and global change, perform significantly better on the X1e than on the XT3 while other applications, such as materials science and chemistry, can deliver more science per dollar on the XT3.

Q2. The Industrial Technologies program at DOE has a long history of supporting research and development into making some of our most valued core domestic industries, the same industries that are rapidly heading overseas. Yet, this administration continues to decrease support of this program at a time when it is most needed. Please explain how a 25 percent decrease in funding for industrial technologies will affect our core domestic industrial sector.

A2. Industries, particularly our core domestic energy-intensive industries, are succeeding in their attempts to be more energy efficient, in part because of the past successes of this program and because of the obvious economic incentives they face to cut energy costs. Continuing activities in the Industries of the Future (Specific) program will focus on bringing existing projects to successful commercialization and evaluating opportunities for greater performance in FY 2006.

Q3. Transmission Reliability R&D request is being cut by more than 40 percent, from $15.6 million to $9.2 million. This is occurring at a time when the Nation's bulk power transmission is undergoing stresses and strains due to increased demand for electric power and a lack of new transmission lines.

Many observers believe that we will not be able to build enough transmission capacity to meet demand and that we will have to use the capacity we have better and smarter. Why is the Administration cutting these programs now in light of these circumstances?

A3. The FY 2006 budget request for the Office of Electric Transmission and Distribution, which includes activities formerly conducted by the Office of Energy Assurance, supports those activities which the Administration believes will ensure electricity reliability and energy critical infrastructure protection.

For instance, as a leader in the Eastern Interconnection Phasor Project, the Department is working in partnership with the electric industry to transform the way that electric grid operators monitor and process real-time information, to accelerate response times to problems in system voltage and frequency levels. In addition, the GridWorks program is focused on development of next generation "hardware" technologies (e.g., sensors; cables and conductors; substation and protective equipment) to address reliability concerns.

The FY 2006 budget request of $95.6 million, which includes Energy Assurance activities merged by Congress with OETD activities in FY 2005, is a 19.4 percent reduction to the FY 2005 enacted level for these programs. However, funding for Congressionally-directed projects in FY 2005 accounted for 43 percent of OETD's overall budget. When the FY 2005 level is adjusted for this, the FY 2006 request reflects an increase of over $25 million compared to the adjusted FY 2005 level.

Q4. Recent studies indicate that domestic natural gas production is declining at a rate of nearly 30 percent per year and we're now importing more than 60 percent of our oil. Geologists agree that there is much moil and natural gas left in the United States but utilizing it will require unconventional recovery techniques. Yet, the major integrated oil companies have largely abandoned U.S. onshore production in favor of offshore production and production opportunities overseas. Today, I'm told that independent oil and gas producers produce more than 60 percent of the oil and about 75 percent of the natural gas sold in this country, but they have no ability to conduct the research needed to get the hard-to-find and produce hydrocarbons out of the ground. In light of that fact, what is the justification for your proposal to shut down the oil and gas research programs at this time?

A4. While it is true that the production rate of new natural gas wells declines about 30 percent per year, industry has been able to maintain domestic gas production. In fact, U.S. gas supplies increased overall to 19.4 Trillion cubic feet (tcf) in 2003

from 19.2 tcf in 2000. You are also correct that independents produce a large percentage of domestic oil and natural gas. Although the smallest independents have traditionally funded little research, other independents, the service companies that supply technology to the independents, and the majors have the financial incentive and resources to develop new ways to extract oil and gas from the ground more cheaply and safely.

The Energy Information Administration (EIA) reports that the 28 U.S. major energy companies spent $370 million on oil and gas recovery research and development in 2003, the latest available data. An analysis of industry R&D spending (1997–2000), reported by the Interstate Oil and Gas Compact Commission, showed that the oil and gas service industry spent $631 million per year on R&D. The Department believes that recent high oil and gas prices provide the incentive to substantially increased private R&D investments. After careful review of the oil and gas programs, it was determined that the industry has the capacity to pursue this research.

Clean Coal Power Initiative

Q5. The FY 2006 budget request includes $50 million for the Clean Coal Power Initiative, which is the $2 billion, 10-year program the President announced four years ago to demonstrate clean burning coal technologies. What is the status of the funding for this program, and should the Administration have provided more than $50 million for this initiative to keep the program on schedule?

A5. The Fiscal Year 2006 budget supports the Department's continuing effort to fulfill President Bush's 10-year, $2 billion commitment to clean coal research, with funding for the President's Coal Research Initiative (CRI) of $286 million, a $13 million increase over the 2005 enacted level. The 2006 Budget brings the total requested funding for clean coal research to $1.6 billion over five years, on pace to exceed the President's ten-year pledge by more than 50 percent.

Within the President's Coal Research Initiative, the Clean Coal Power Initiative (CCPI) is a key component of the National Energy Policy to address the reliability and affordability of the Nation's electricity supply, particularly from its coal-based generation. The Fiscal Year 2006 Budget request includes $68 million for CCPI, $50 million of which is for demonstration projects and $18 million for FutureGen, the world's first near-zero emissions coal-fueled power plant. The Department believes the FY 2006 request is adequate to maintain the overall schedule of the Clean Coal Power Initiative.

The $50 million allocated for the cooperative, cost-shared CCPI program between government and industry will be devoted to continuing the rapid demonstration of emerging technologies in coal-based power generation, which should accelerate commercialization by the private sector.

The CCPI's FutureGen program will establish the capability and feasibility of coproducing electricity and hydrogen from coal with essentially zero emissions, including carbon sequestration and gasification combined cycle, both integral components of the coal-fueled power plant of the future. In addition to scheduled financing of $18 million for FutureGen in Fiscal Year 2006, the Budget also includes a commitment to FutureGen beyond 2006, by proposing $257 million to become available in 2007 to provide the federal share of FutureGen for several years. This sum corresponds to unexpended funds available from prior years' clean coal projects.

Questions submitted by Representative Eddie Bernice Johnson

Historically Black Colleges and Universities

Q1. History has proven when it comes to budget cutting time, minority education programs get cut first. Since 1995, funding for minority education programs has dropped drastically. In 1995, funding levels for Historically Black Colleges and Universities (HBCUs) were at $59.1 million or 8.4 percent of all funding for institutions of higher education. Since then, funding levels have substantially decreased. In fact, in 2004, HBCUs only received $10.8 million, only 1.4 percent of all institutional funding for higher education. We all agree that America needs a diverse work force to remain prosperous. How are you going to rectify this serious spending inadequacy? (see chart below)

MINORITY EDUCATION FUNDING AS A PERCENT OF

ALL INSTITUTIONS OF HIGHER EDUCATION

(DOLLARS IN MILLIONS)

FY	IHEs	HBCUs	%	HSIs	%	TCUs	%	TOTAL
1995	701	59.1	8.4	10.1	1.4	2.9	0.4	72.1 (10.3 %)
1996	728	36.8	5.1	40.8	5.6	4.0	0.5	81.6(11.2%)
1997	661	31.3	4.7	43.1	6.5	4.2	0.6	78.6 (11.9 %)
1998	627	23.7	3.8	32.0	5.1	8.0	1.3	63.7 (10.2 %)
1999	714	20.2	2.8	39.0	5.5	2.5	0.3	61.7(8.6%)
2000	620	17.1	2.8	27.7	4.5	1.5	0.2	46.3(7.5%)
2001	831	13.5	1.6	28.4	3.4	1.2	0.1	43.1(5.2%)
2002	733	12.7	1.7	30.4	4.1	0.3	0.04	43.4 (5.9 %)
2003	861	13.1	1.5	40.1	4.7	0.8	0.09	54.1 (6.3 %)
2004	773	10.8	1.4	22.0	2.8	0.9	0.12	33.7 (4.4 %)

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HEs .All Institutions of Higher Education
HBCUs .Historically Black Colleges and Universities
HSIs .Hispanic Serving Institutions
TCUs .Tribal Colleges and Universities

A1. Under my leadership, we are committed to the following initiatives in FY 2005: (1) to establish a goal of $33.2 million to support programs for Historically Black Colleges and Universities (HBCUs), which is $22.4 million above actual awards in FY 2004; and (2) to establish a corporate strategy for increasing support for HBCUs and other minority serving institutions, which includes developing a Broad Agency Announcement to encourage the participation of HBCUs in the Department's competitive awards, supporting internships for students at DOE and/or its national laboratories, encouraging faculty exchange programs at DOE national laboratories to enhance faculty research capabilities, and convening annual regional information meetings to inform HBCU faculty and administrators of DOE programs and funding opportunities.

Q2. According to the National Academy of Sciences, significant reductions in oil use from a transition to hydrogen are at least one or two decades away. How does your budget proposal treat R&D efforts that are more focused on near-term results, such as research on lightweight, high-strength automotive materials, hybrid vehicles and advanced diesels? How can DOE do a better job of encouraging the adoption of these energy-saving technologies into the marketplace?

A2. The calculation was made by 1) analyzing geology and geophysical information to determine geology parameters; 2) conducting an engineering analysis of the exploration, development, production, and reclamation phases for the potential range of sources; and 3) running an economic analysis of 1) and 2) under projected market conditions. As we have stated a number of times, this estimate has been used for several years and does not reflect the recent sharp increases in the price of oil. The estimate included an assumption regarding oil prices in the year 2001 of $30. It assumed a 50/50 split of revenues with the State of Alaska, a royalty rate of 12½ percent, and that almost all tracts would be available for nomination in each sale. The model used for the analysis was a Monte Carlo Discounted Cash Flow model. In addition, natural gas was assumed at the time of the analysis to be uneconomic and was thus ignored in the valuation.

Questions submitted by Representative Michael M. Honda

Q1. Secretary Bodman, still looking at the Energy Efficiency and Renewable Energy numbers, I see that significant cuts were requested for Building Technologies (−12 percent) and Industrial Technologies (−25 percent). I know that the Vice President has said that conservation is a virtue but shouldn't be a part of energy policy, but I disagree with that sentiment. In California, where consumers were the victims of market manipulation by Enron, consumers only recourse was to use less energy, to conserve. As long as our energy consumption level remain high, Americans remain vulnerable to Enron-like manipulation at home and to OPEC internationally. And yet this budget cuts funding for efficiency programs,

at the time when we should be making this one of our highest priorities. Dr. Secretary, what is the rationale for doing this?

A1. We have focused on our most cost-effective activities that meet the Administration's general R&D investment criteria (quality, relevance, and performance) and the additional criteria (for industry-related programs) that ensure that federal investment is appropriate, well-planned, and has the potential to deliver significant public benefits.

On buildings technologies, we have developed a great many buildings technologies and techniques that have not yet been adopted by builders or demanded by consumers. Higher energy prices may change that. However, until we are more successful in getting existing technologies adopted, we are reducing some of our new building technology development activities.

As for industrial technologies, because industry is less likely to invest in R&D toward long-term energy-savings technologies, our Industrial Technologies Program is focusing on a fewer number of higher-risk, higher-reward technologies, and our budget reflects that. Fortunately, the industrial sector of the economy is already quite energy efficient, since it has an economic incentive and the financial means to reduce energy use as a component of its overall cost of production.

Basic Research in the Office of Science

Q2. Secretary Bodman, I notice that within the Office of Science, the impact of the budget is borne primarily by grants to individual researchers would be far larger. Some programs see cuts as great as a 10 percent, in order to maintain support for large user facilities. While I applaud the support for user facilities, are we going to be able to use these facilities to their full potential if we don't provide the funds for the researchers to use them? Dr. McQueary just testified that the Department of Homeland Security was going to depend more and more on the output of DOE funded basic researchers to feed the efforts of his agency, and the Department of Defense has said similar things. If we cut the funds for this research, are we not compromising our national security? If other agencies are justifying cuts by saying that your agency is doing the research, do you feel some obligation to it? Do your agencies talk to each other about this? Because it doesn't seem like you are all on the same wave length.

A2. The FY 2006 President's Request for the Office of Science represents a reduction of 1.6 percent from the FY 2005 appropriation when Congressional directions for FY 2005 are set aside and is 0.9 percent above the FY 2005 President's Request. Within this budget, the Office of Science can and will provide world leadership in science that contributes so heavily to our national security. Indeed, it is this responsibility that has led to the priorities that are contained in the FY 2006 Office of Science budget request. These priorities balance support for individual investigators with support for forefront facilities, which will transform the way we do science from manipulating matter to discovering the deepest secrets of the universe. The President's FY 2006 budget propels the United States into leadership in a number of areas, including nanoscience and nanotechnology; neutron scattering for the study of materials and their properties; x-ray science with pulses so short that they will allow the study of chemical reactions as they occur; leadership-class computing for discoveries in all areas of science; ITER, an experiment which will demonstrate the feasibility of using deuterium-tritium fusion to produce large amounts of clean energy; climate change research; and more. Moreover, the Office of Science continues its leadership role in such research areas as condensed matter and materials sciences; chemistry and catalysis; biosciences and genomics; research to enable the coming hydrogen economy; and high-energy, nuclear, and plasma physics. Within this budget, we have endeavored to nurture principal investigators in our core research areas and to ensure that all of our research activities are coordinated. Basic research in the Office of Science supports applied research conducted by other DOE programs and other federal agencies.

National Ignition Facility

Q3. Secretary Bodman, can you give us a status report on the National Ignition Facility (NIF)? What is a realistic timetable for the first attempt at ignition? What is the impact of this budget request on that timetable? And what do you see is the role of NIF in basic scientific research?

A3. The National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL) continues to be an essential component of the Stockpile Stewardship Program. Consistent with the strong views of the Congress, we are continuing to-

wards full commissioning of all 192 beams and focus on the 2010 ignition goal. To do this, however, we have had to accept additional risks and reduce some other inertial confinement fusion work at LLNL and other sites. The Fiscal Year (FY) 2006 request of $460.4 million for the Inertial Confinement Fusion and High Yield Campaign, a 14 percent reduction from FY 2005, reflects those reductions.

The NIF Activation and Early Use Plan defines the experimental program to be executed on NIF through the demonstration of ignition. Due to reductions in the FY 2005 appropriations for the NIF Demonstration Program and changes in the FY 2006–2010 funding profile from that previously planned, the NIF Activation and Early Use Plan is being modified. NNSA will provide a revised NIF Activation and Early Use Plan to Congress by June 30, 2005, which will describe the implications of these budget changes.

Inertial fusion ignition is one of the greatest technical challenges ever pursued by the Department. The demonstration of ignition at NIF will allow the Stockpile Stewardship Program to address weapon performance issues related to thermonuclear burn, while simultaneously advancing our understanding in many areas of basic science. Further, consistent with the established NIF mission, and as allowed by established program objectives and requirements, a portion of the NIF experimental opportunities will be available to the technical community to pursue unique research opportunities after ignition has been achieved. The new temperature and pressures regimes accessible with NIF will open up a host of new opportunities in basic research, ranging from laboratory astrophysics to fundamental materials properties. In the National Research Council's 2003 report, "Frontiers in High Energy Density Physics," it states,

> ". . .research opportunities in this crosscutting area of physics are of the highest intellectual caliber and are fully deserving of the consideration of support by the leading funding agencies of the physical sciences."

Question submitted by Representative Lincoln Davis

New Programs for SciDAC

Q1. Secretary Bodman, you may be aware that I support the United States regaining leadership in high-end computing and co-sponsored the Department of Energy High-End Computing Revitalization Act of 2004. *The purpose of this bill is to support the computational needs of non-classified scientific research. I'm proud that the Oak Ridge National Laboratory has been selected to be the home of the new facility that will be the Center for Computational Sciences (CCS)—the most powerful supercomputer in the world.*

The facilities plan for the Office of Science ranks CCS as the #1 domestic priority, yet the budget does not reflect a commitment to this priority. I understand that the total request for the Office of Advanced Scientific Computing Research is down $25 million, funding for CCS is down $42 million, but the request includes two new "starts" totaling about $21 million.

Please explain the reasons behind starting two new programs for Scientific Discovery through Advanced Computing (SciDAC) teams within the Office of Advanced Scientific Computing Research budget while failing to find funds to keep high performance computing efforts on track at the Oak Ridge National Laboratory.

A1. The principles behind the budget decisions are to deliver the most science for the Nation given the funds available. The Advanced Scientific Computing Research (ASCR) budget includes $13 million for research and evaluation prototype computers and $8 million for a new competition for SciDAC institutes. The research and evaluation (R&E) prototype activity has been a part of the ASCR budget for a number of years. In FY 2005 the CCS will complete the evaluations that were funded in prior years. Therefore, we will solicit proposals for new R&E prototypes in FY 2006. This type of activity was strongly endorsed in the *Federal Plan for High-End Computing,* which was published by the Office of Science and Technology Policy last May. The new competition for SciDAC institutes will increase the impact of our investments in applied mathematics and computer science and respond directly to the direction in the *Department of Energy High-End Computing Revitalization Act of 2004* to establish high end computing software development centers for Leadership Class Computing.

Question submitted by Representative Brian Baird

Q1. In a recent story in the Seattle Times, *you were quoted as saying that the Bonneville Power Administration (BPA) "is subsidized by other (non-Northwest) taxpayers."* (http://seattletimes.nwsource.com/html/localnews/2002179458_bpa14m.html). *In fact, Northwest ratepayers have repaid the Treasury with interest for the construction and operation of the system and we continue to do so. As you know, Northwest ratepayers made another billion dollar payment to Treasury this past September.*

Can you explain for me how you and others in this administration justify labeling BPA as being subsidized by taxpayers?

A1. The Administration has stated in the President's FY 2006 Budget that "According to the Government Accountability Office (GAO), PMA rates are artificially low because taxpayers across the Nation have borne some of the PMAs' costs. Thus, the general taxpayer has helped subsidize the costs of PMA power purchased by electricity wholesales."

At the time of the GAO review, two categories of net costs to the federal government were identified for BPA (GAO/AIMD 97–110A). One was the full cost of providing Civil Service Retirement System pension benefits and the costs of providing post-retirement health benefits to current employees. The other area was identified as net financing costs, which GAO defined as the difference between the interest income received by the Federal Government on appropriated debt and the Federal Government's related interest expense.

Questions submitted by Representative Jim Matheson

Q1. Are you aware that the tailings pile currently rests 10–15 feet above the water level of the Colorado River, a major water source for the millions of people who live downstream?

A1. Yes. The Department has completed extensive site characterization to confirm that the bottom of the contaminated tailings pile is 10 to 15 feet above the water level of the Colorado River.

Q2. A National Academy of Sciences report emphasized the risks posed by the location of the radioactive tailings next to the Colorado River, stating it was a "near certainty" that, left unchecked, the river would run across the Moab site at some point in the future. Do you agree with these conclusions and how will DOE address the NAS report's concerns?

A2. DOE has incorporated the National Academies of Sciences' conclusions into the environmental impact statement (EIS). The Final EIS will have a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q3. Are you aware that on 26 occasions since 1914, the river has reached a flow level great enough to inundate the base of the tailings pile?

A3. The Department's understanding is that the flood that occurred in 1984, referred to as the 100-year flood, is the only flood in which the flood level actually reached the toe of the tailings pile, but did not inundate the base of the tailings pile.

Q4. Are you aware that a November 2003 report by DOE, which stated that the Colorado River would only migrate away from the tailings pile and would not undermine the tailings embankment, has been proven wrong?

A4. The Department of Energy (DOE) is not aware of any data that proves the DOE November 2003 Colorado River Migration report is incorrect.

Q5. Are you aware that the U.S. Geological Survey (USGS) has recently stated that during a "100-year flood" the Colorado River could feasibly climb 25 feet up the tailings pile, the channel could deepen and narrow, and water could move much more swiftly through the tailings site? How do you intend to address USGS's findings, given the Department's erroneous previous conclusions?

A5. The U.S. Geological Survey report states that under the 100-year flood scenario, the river level would climb approximately four feet up the tailings pile as occurred during the 1984 flood. The report also indicates that during this flood event, the unprotected pile would not be breached because velocities would decrease as the river flows over its banks.

Q6. How will DOE incorporate into the Final Environmental Impact Statement the USGS's findings from a February 1, 2005, Open File Report that a 100-year flood event could erode a very long stretch of the Colorado River bank on the side of the river that contains the tailings?

A6. The findings in the U.S. Geological Survey's (USGS) recent Colorado Streamflow Simulation Report are being incorporated into the final environmental impact statement (EIS) analysis. The Department will continue to work with the USGS through the finalization of the EIS to ensure that the Department is interpreting the USGS data correctly. The Final EIS will have a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q7. Is DOE planning to take "100-year floods" conditions into account when making the decision about the how to remediate the Atlas tailings pile?

A7. Yes, the draft environmental impact statement (EIS) assesses the consequences of both the 100-year flood, and the probable maximum flood. The Department will incorporate into the Final EIS a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q8. Given the risk of damage downstream if flooding occurs on the Colorado River at the Atlas site, why would DOE opt not to remove the tailings pile from the banks of the river?

A8. The Department is in the process of developing the final environmental impact statement (EIS) for the Moab uranium mill tailings site. The Final EIS will have a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q9. Are you aware that NAS identified river erosion and migration as a critical issue that must be resolved before DOE makes its decision about how to remediate the site of the Atlas Tailings pile? How will the Department address the issue of river erosion with respect to the tailings?

A9. Yes. The Department is aware that river migration is a critical issue and has incorporated design elements into the draft environmental impact statement (EIS) to address this concern. The broad range of remedial action alternatives identified in the Draft EIS have been analyzed for impacts due to natural phenomena hazards, such as flooding, river migration, seismic activity, and erosion, taking into account the effects of mitigating measures such as a barrier wall to prevent river migration and riprap-covered side slopes that would mitigate the erosion forces of the river at flood stage. Based on the Draft EIS analysis and nearly 1,400 comments received, the Final EIS will have a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q10. Has DOE considered in its analysis a report by the National Research Council, which concluded that flooding is a near certainty at the site?

A10. Yes. The draft environmental impact statement addresses flooding and quantifies the impacts that would result.

Q11. Are you aware that the tailings pile is leaking ammonia, various metals, and radio-nuclides into the river, such that when the U.S. Fish and Wildlife Service did fish surveys, the caged minnows they dipped into the water, died instantly?

A11. The Department is aware of the existing impacts from this former uranium-processing site and the U.S. Fish and Wildlife Service surveys.

Q12. Are you aware that, contrary to DOE reports, an independent study by University of Utah hydrologists determined that contamination from the Atlas tailings pile has traveled under the Colorado River, towards the town of Moab and the aquifer that provides drinking water to the community?

A12. The Department is aware of the University's study. The Department, with the aid of other federal organizations and several experts, has collected data that does not support those conclusions in the University of Utah's investigation. Nonetheless, based on the draft environmental impact statement (EIS) and nearly 1,400 comments received on the Draft EIS, the Final EIS will have a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q13. A report by the House Government Reform Committee found that, of the 22 uranium tailings piles located along the Colorado River corridor, the Atlas tailings site was the only pile that had not been removed. In fact, DOE has removed the tailings piles from all Uranium Mill Tailings Radiation Control Act *(UMTRCA) sites located within a flood plain, with the exception of the Atlas site. Given this history, why would DOE choose not to remove the tailings from their current site?*

A13. The Department has remediated 21 of the 22 uranium mill tailings sites under Title I of the *Uranium Mill Tailings Radiation Control Act.* Two of the 21 sites (two at Rifle, Colorado) were located adjacent to the Colorado River and the tailings were removed from the floodplain. Of the other 19 Title I sites remediated by DOE, ten were stabilized in place and nine were relocated. Based on the draft environmental impact statement (EIS) analysis and the 1,400 comments received on the Draft EIS, the Final EIS will have a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q14. Congress stated in the Floyd Spence Defense Authorization bill that "The Secretary (of Energy) shall conduct remediation at the Moab site in a safe and environmentally sound manner that takes into consideration A) ground water restoration and B) the removal, to a site in the State of Utah, for permanent disposition and any necessary stabilization of residual radioactive material and other contaminated material from the Moab site and the floodplain of the Colorado River." Given Congress' intent to remove the tailings pile from its current location, why did DOE choose not to designate a preferred alternative in the Draft Environmental Impact Statement that would move the tailings to another location?

A14. Based on the draft environmental impact statement (EIS) analysis and the 1,400 comments received on the Draft EIS, the Final EIS will have a preferred alternative of disposing of the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q15. DOE has previously stated that the legislative history of UMTRCA stressed the importance of avoiding remedial action that would only be temporarily effective. Given the probability that flooding will occur in at the Atlas tailings site while the uranium tailings are still radioactive and the fact that such an event would require further remediation of the tailings pile if it is left on site, why would the Department of Energy consider a remediation plan that leaves the tailings pile on site?

A15. The *National Environmental Policy Act* requires that all reasonable alternatives, including the no action alternative of leaving the pile in place, be analyzed. The broad range of remedial action alternatives identified in the draft EIS have been analyzed for impacts due to natural phenomena hazards, such as flooding, river migration, seismic activity, and erosion. Based on the draft environmental impact statement (EIS) analysis and the nearly 1,400 comments received on the Draft EIS, the Final EIS will have a preferred alternative of disposing the tailings pile and other contaminated material, primarily via rail, at the proposed Crescent Junction disposal site.

Q16. I am concerned that short-term cost considerations are dominating DOE's decision on how to remediate the tailings pile. It is equally, if not more, important to consider the life-cycle costs of the remediation options over time. A NAS report found that capping the tailing pile in place at the Atlas tailings site would require long-term maintenance and further investment. Has DOE considered the life-cycle costs that would develop over the long-term if the decision was made not to remove the tailings from the site?

A16. Yes. The draft Moab Environmental Impact Statement (EIS) considers the life-cycle costs of all on-site, off-site, and groundwater alternatives, as well as cumulative impacts and risks. As reported in the draft EIS, the life-cycle cost for the on-site stabilization alternative is $249 million and the relocation alternatives cost estimates range from $407 million to $542 million. These cost estimates include long-term groundwater extraction, as well as routine maintenance.

Long-term groundwater remediation is required for a period of 75 to 80 years, regardless of the tailings pile remedial action employed.

Q17. Congress has dedicated funding toward the remediation of the Atlas Tailings site in Fiscal Years 2001, 2002, 2003, 2004, and 2005. How much funding is DOE requesting in the Fiscal Year 2006 budget to initiate the tailings removal?

What activities will that funding cover? Would additional funding enable DOE to proceed more promptly with this clean-up work?

A17. The FY 2006 Congressional Budget Request for the Atlas site in Moab, Utah, is $28.06 million. The following activities are planned: complete Remedial Action Plan (conceptual design); support the U.S. Nuclear Regulatory Commission's review and concurrence with remedial action plan; initiate detailed reclamation design; initiate construction of final groundwater corrective action system; continue operation/optimization of interim groundwater corrective actions to accelerate interim protection of threatened and endangered species; continue to monitor the groundwater and surface water; continue characterization and remediation of vicinity properties; and operate and maintain site including tailings dewatering system, access controls, health and safety, surface controls and air monitoring, and vegetation/habitat improvements. The Department has requested funding commensurate with an accelerated schedule and additional funding at this planning and early design phase of the project would not necessarily enable further acceleration.

Nuclear Weapons Testing

Q18. During your recent testimony before the SASC, you seemed to indicate that nuclear weapons testing might resume sooner than has been previously acknowledged by DOE. Please comment or elaborate on this issue.

A18. I want to be clear about our plans. We have no plan to resume underground nuclear testing; our efforts to improve test readiness are a prudent hedge against the possibility of a problem arising in the stockpile that cannot be confirmed, or a fix certified, without a nuclear test. Our goal is to achieve an 18-month test readiness posture as directed by section 3113 of the *National Defense Authorization Act for Fiscal Year 2004* (Public Law No. 108–136). At the February 15, 2005, Senate Armed Services Committee hearing, I said that the DOE continues to be committed to that requirement of the law, and the budget that has been proposed by the President is consistent with that program.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Arden L. Bement, Jr., Director, National Science Foundation

Question submitted by Representative Michael M. Honda

Q1. In 2002, President Bush signed into law a bill that was intended to double the NSF budget. Clearly, this is not reflected in the NSF's budget request. Dr. Marburger has testified before this committee that "this Administration understands that science and technology are major drivers of economic growth" and presumably that is why the President signed the bill. But once again the President has delivered a budget that fails to back up the lofty rhetoric. Cutting funding for math and science education will hamper our nation in the very fields he claims are drivers of economic growth.

How do you explain this lack of follow through, especially given what Dr. McQueary has said about how his agency plans to rely on discoveries made by scientists funded by NSF? Please don't just tell me that these are tight budget times. The President seems to be able to come up with money for more tax cuts, but not to invest in our futures.

A1. The *National Science Foundation Authorization Act of 2002* (P.L. 107–368, December 19, 2002) outlined three overarching objectives: to bolster the United States' lead in science and technology, to enhance workforce skills, and to increase innovation and competitiveness by expanding the focus of related policy at the regional and local levels. Funding authorized in this bill would have effectively doubled NSF's budget from $4.96 billion in FY 2002 to $9.84 billion in FY 2007.

Recent events, however, have made this funding path unlikely in the near term. The President's budget, as you know, focuses on winning the war on terror, securing the homeland, and restoring fiscal balance. Amid these priorities, the Administration requests a 2.4 percent funding increase for NSF at a time when domestic discretionary spending is decreasing. Senate Report 108–353, issued by the Senate Committee on Appropriations (September 21, 2004), notes the significance of overall funding constraints:

> "The Committee continues to be supportive of the efforts achieved in the National Science Foundation Authorization Act of 2002 (Public Law 107–368) and the pursuit of a doubling path for NSF funding. However, due to funding constraints, the Committee is not able to provide such funding at this time, but will continue to pursue these efforts in the future." (p.135)

Despite these constraints, the President has recognized the importance of the goals outlined in the 2002 Authorization. NSF's FY 2006 Budget Request is built around four funding priorities: 1) strengthening core disciplinary research, 2) providing accessible cyberinfrastructure and world-class research facilities, 3) broadening participation in the science and engineering workforce, and 4) sustaining organizational excellence. This focus on a clear set of priorities will help the Nation meet new challenges and take advantage of promising opportunities while spurring growth and prosperity. In short, the FY 2006 Request seeks to maintain the science and education investments needed to achieve the objectives of the FY 2002 Authorization. Although the timeline has changed, these objectives have not.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Theodore W. Kassinger, Deputy Secretary, U.S. Department of Commerce

Questions submitted by Chairman Sherwood L. Boehlert

Q1. Some companies have told us that they are at a competitive disadvantage around the world because the other nations are choosing European standards over U.S. standards. The European standards-setting process is government-funded and government-led, while the U.S. system is more market-based and industry-driven. Does our system put our companies at a disadvantage? If so, what should we do about it?

A1. The United States is a market-driven, highly diversified economy and society, and our standards system encompasses and reflects this framework. Our decentralized, sector-based standards system, which is based on a strong public-private sector partnership, is diverse and inclusive, and supports flexible solutions. U.S. companies derive significant advantage from the system's flexibility and responsiveness.

Many U.S.-developed standards are used globally. Depending on a specific sector's needs, preferred standards may be U.S. standards, those developed by the International Organization for Standardization or International Electrotechnical Commission (IEC), or other globally recognized standards, including consortia-developed standards.

Many European Union (EU) regional standards are demand-driven as well, but some are developed specifically to meet European regulatory requirements. It is these standards, and accompanying European regulations, that are not only used in the growing EU market, but are also being promoted for use in emerging economies, which comprise some of the major U.S. export markets. In these markets, the EU devotes more resources than the United States to standards-related technical assistance.

The U.S. Government, working with the private sector, can do a better job of promoting U.S. standards interests in our most important markets. Our message needs to incorporate U.S. principles of effective standardization, which stress that standards development be driven by the marketplace, stress that those standards have good technical content, and allow for multiple technologies. The fact that U.S. Government agencies rely to a great extent on private sector standards in their own regulatory and procurement activities should be a part of our message to foreign governments as well. The importance of developing a positive and persuasive message is especially critical in key emerging markets where standards regimes are still in the formative stage.

The Commerce Department launched its Standards Initiative in 2003 to ensure that the Federal Government works effectively to promote U.S. standards interests and to eliminate standards-related market barriers that undermine U.S. exports and threaten the international competitiveness of U.S. industry. A Departmental report—*"Standards & Competitiveness: Coordinating for Results,"* May 2004 which can be found at *http://ts.nist.gov/ts/htdocs/210//trade_barriers_report.pdf*—presents a broad set of recommendations, some of which address outreach and promotion.

The Commerce Department is working with partner agencies on the Trade Promotion Coordinating Committee to build on these recommendations and craft a trade promotion strategy for the coming year that recognizes the importance of standards to the export competitiveness of American companies. Our strategy aims to develop an ambitious partnership with U.S. manufacturers and service providers, and the U.S. standards community, to better promote U.S. standards interests in our most important markets. This includes not only emerging, fast-growing markets such as China, but also the EU itself, where we are working under the framework of the U.S.–EU Regulatory Cooperation Roadmap to identify areas where we can coordinate to facilitate a barrier-free transatlantic marketplace.

Q2. While we are generally supportive of the Administration's proposal to expand tsunami detection and warning capabilities to all U.S. coasts and territories, the National Oceanic and Atmospheric Administration's (NOAA) budget request cuts by nearly 50 percent (from $4.3 million to $2.3 million) the Tsunami Hazard Mitigation Program. This program provides funding for education and outreach activities as well as helps local communities with evacuation planning. Witnesses at our tsunami hearing stated that these education activities were just as important as the technology for detection. Why was this program cut in half when NOAA is requesting $9.5 million for new buoys?

A2. The President's fiscal year (FY) 2006 Budget request of $2.3 million for the National Tsunami Hazard Mitigation Program (NTHMP) is the same amount as the Administration has requested in past years. In FY 2005, the Congress appropriated an additional $1.9 million for the NTHMP.

In addition to the $2.3 million for the NTHMP requested in the President's FY 2006 Budget, the Administration's two-year tsunami warning proposal, which is not just for new buoys, allocates an additional $4.75 million for education and outreach, and mitigation and inundation mapping. NOAA's inundation mapping and modeling efforts are a critical component to community preparedness, providing information on safe evacuation routes. Also critical are NOAA's efforts in public education and outreach, including the TsunamiReady program. Of the $4.75 million allocated, $2.25 million will be spent on inundation mapping and modeling and $2.5 million will go towards public education activities. The Administration's two-year proposal also directly funds NOAA's operation and maintenance costs for the Deep-ocean Assessment and Reporting of Tsunamis (DART) buoys, and continued research and development for the DART systems; these activities were previously funded by the NTHMP. With the Administration's proposal funding activities formerly contained within the NTHMP line item, more of the $2.3 million base funding for the NTHMP can be directed towards education and outreach efforts. Overall, the Administration is increasing funding for tsunami education and outreach with the President's FY 2006 Budget Request.

Questions submitted by Representative Bart Gordon

Q1. The Administration is requesting $1.05 billion for its Nanotechnology Initiative in FY06. Last week, I met with some small start-up nanotech firms who are members of the Nanotechnology Alliance. They said their biggest hurdle was the lack of funding to translate research results to proof-of-concept—crossing the so-called valley of death. Though they thought the U.S. was leading in most areas of basic nanotechnology research, they also felt that we were falling behind in applied research. Other countries have specific programs to fund applied nanotechnology research. These nanotech firms mentioned the Advanced Technology Program (ATP) as bridging this gap in the United States and said that we needed to support the ATP (or some similarly designed program) in order to ensure the U.S. reaps the benefits in terms of jobs and economic competitiveness. You propose eliminating the ATP. Why isn't the Administration listening to the concerns of our high-tech entrepreneurs?

A1. The United States has the deepest pool of private investment capital in the world available to entrepreneurs with credible project funding proposals. According to the National Venture Capital Association an estimated $20.9 billion was invested by venture capitalists in the United States in 2004. The Department appreciates the Committee's efforts in promoting nanotechnology. We share the desire to translate research results to proof-of-concept and see to it that our nation does not fall behind in applied research. Nevertheless, we believe that other National Institute of Standards and Technology (NIST) research and development programs have profoundly greater impact than the ATP, and are essential to the continued technological leadership of U.S.-based business, American workers, and the economy. In this time of budgetary constraint, the Administration believes that reductions must be made to certain programs so that available resources can be redirected towards higher priority initiatives.

Q2. The Administration proposes a $47.5 million increase for the National Institute of Standards and Technology (NIST) lab programs. Generally, I would be pleased about this increase, but it seems to be based upon source budget gimmicks similar to Enron and WorldCom accounting. The NIST budget request does not include ATP close-out costs. It is my understanding that termination costs would include:

- *$15 million for employee termination [the Office of Management and Budget estimates $12 million, NIST estimates $18 million];*
- *$13 million of ATP funds which are transferred to the NIST lab program; and*
- *$43.5 million in funding for existing ATP projects.*

Thus, ATP close out costs could be as high as $71.5 million. Why didn't the Administration include ATP close-out costs in its budget request? And had you included these close-out costs, what would have been the impact on the budget request?

A2. We understand your concerns with respect to ATP close-out costs, and we agree that an orderly shutdown of the ATP is not without expense, and we believe that the proposed shutdown can be accomplished within the proposed Department of Commerce budget. If Congress enacts the FY 2006 President's Budget proposal to terminate funding for ATP, the Department of Commerce and NIST will pursue all available means to address the termination cost requirements, consistent with legal obligations and sound management practices.

Q3. Since 2001 we have lost 2.8 million manufacturing jobs. This past December alone we lost another 25,000. The Administration's FY 2004 Manufacturing Extension Program (MEP) Impacts Report says that MEP increased sales by $4 billion and created over 50,000 jobs (these numbers reflect results from just ¼ of the recipients, so they are very conservative).

Q3a. What other federal program produces the kind of return on investment that MEP has demonstrated?

Q3b. Given the performance of MEP and the economic situation in manufacturing, why hasn't the Administration brought forward a budget proposing to expand MEP?

Q3c. How many MEP centers will end up being closed under this proposal and where are they located?

A3a,b,c. The Administration proposes to fund the program at $46.8 million. With about 50 percent of the FY 2005 center grants, the Administration seeks to maintain a national network of centers while focusing funding based on centers' performance and need. The FY 2006 Budget is not intended to reduce the number of centers.

The President's FY 2006 Budget aims to promote economic growth by supporting innovation and technological advancement through investment in federal science and technology programs. In the FY 2006 Budget, total federal R&D investment is $132.3 billion, an increase of $733 million over this year's record R&D budget and a 45 percent increase compared to FY 2001's $91.3 billion budget. Funding for basic research, the fuel for future technology development, is $26.6 billion in FY 2006, compared to $21.3 billion in FY 2001—a 26 percent increase. Ninety-five percent of this spending occurs outside the Department of Defense. The FY 2006 Budget also includes a 12.7 percent increase for the laboratory programs at the National Institute of Standards and Technology, which provide the infrastructure necessary to promote innovation and enhance the productivity and competitiveness of U.S. manufacturers.

The President worked with Congress to provide tax relief that has benefited manufacturers of all sizes and supports permanent extension of the research and experimentation tax credit, as well as legal, regulatory and other policy changes to strengthen the manufacturing sector.

As recommended in the Administration's Manufacturing Report, NIST's Hollings Manufacturing Extension Partnership Program (HMEP) continues to work with the International Trade Administration (ITA) on joint activities in training, and cross referral between HMEP centers and local ITA offices. One of the strengths of the HMEP network has been its utility to other federal agencies; we will continue to aggressively pursue partnerships to leverage the network. Last year, federal partners provided an additional $7 million in funding to centers.

In addition, the Administration has established a special interagency working group under the aegis of the National Science and Technology Council as a forum for developing consensus and revolving issues associated with manufacturing R&D policy, programs and budget guidance and direction. On April 8, 2004, former Secretary of Commerce Evans established the Secretary's Manufacturing Council to ensure that manufacturers of all sizes will have a voice in implementing the Administration's manufacturing initiative.

Q4. The FY03 and FY04 requests for MEP were both $13 million; the FY05 request was $39 million; now we get $46.8 million. Can you explain the process whereby the Administration determines the proper funding level for MEP?

A4. As noted above, the FY 2006 Budget request proposes to fund HMEP at $46.8 million. At this level, the national network of centers will be maintained while focusing funding based on centers' performance and need. The fiscal discipline required in developing this budget, as in other budgets, required making tough choices among competing programs. Those choices vary somewhat from year to year. The FY 2006 Request reflects the Administration's current analysis of priorities for NIST, while adhering to a goal of reducing the federal contribution and putting the

program on a path to self-sustainability that will ultimately strengthen it. We believe that the private sector contributions to the centers can be sustained; therefore, we focused on reducing the administrative costs and grants from the FY 2005 level.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Charles E. McQueary, Under Secretary for Science and Technology, Department of Homeland Security

Questions submitted by Chairman Sherwood L. Boehlert

Q1. The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) funds academic research through university centers of excellence and fellowships for individual students. As a rule, university campuses emphasize the importance of publication of research results. How does DHS balance the need to ensure that research performed at DHS centers is relevant to the most pressing homeland security issues with the importance of protecting information about vulnerabilities? Please describe DHS's official policy for each university center on access to sensitive or classified materials and on DHS pre-publication review of research results. Is this policy included in the contract language?

A1. DHS supports the open conduct and publication of research performed by the Homeland Security Centers of Excellence. The Centers are generally able to conduct their grant-supported research without access to sensitive or classified information. Where such information is necessary, the principal investigators are subject to the customary background checks and security clearances. The Department recognizes that open research may indeed expose vulnerabilities better left protected, and we are working with the Centers to develop guidelines that address this concern, particularly as it relates to publication and dissemination of information. The Office of Naval Research, which acts as our contracting agent in these matters, covers possible constraints on the policy of open publication in the grant terms and conditions it issues.

Q2. Last year, DHS S&T adjusted its policies regarding how DHS S&T funding will be provided to the Department of Energy (DOE) Laboratories.

Q2a. In fiscal year 2005 (FY05), how much funding has been provided to the DOE laboratories by DHS S&T? How were these projects selected as lab-appropriate rather than industry-appropriate? Please provide examples.

A2a. For Fiscal Year 2005, the Science and Technology Directorate has allocated approximately $182 million in funding to the DOE national laboratories to date.

A consensus of the S&T Directorate's executing offices (Office of Research and Development, Homeland Security Advanced Research Projects Agency, and Systems Engineering and Development) decides whether a program is to be based at the National Laboratories by considering:

a. whether the work is inherently the Federal Government's responsibility;
b. whether the work is required to maintain an enduring national capability;
c. whether limited interest in or incentive for private sector engagement creates a technological or knowledge gap; and
d. whether the work will leverage or enhance other Federal, State, and local government investments.

The research directed toward the Department's awareness goal, including knowledge discovery and dissemination and threat characterization, are examples of work that meets these criteria. Such research develops capabilities in the acquisition and interpretation of terrorist threat data with the aim of providing real-time analysis and information processing for policy makers, intelligence analysts, law enforcement officials, human and animal health care communities, and other decision-makers.

- Creation of standards and test protocols for various types of equipment for use in guiding industry and evaluating technologies against minimum performance requirements.
- Establishing, maintaining, and operating test-bed facilities to assess the performance of technologies and technology systems provided by various industry partners in operational environments encountered by DHS users.
- Establishing, maintaining and operating facilities to perform research on WMD forensics capabilities.
- Creating detailed intra- and cross-sector models to simulate inter-dependencies in critical infrastructure, including sensitive information captured from industrial and governmental "owners" of the sectors. The models then support

decisions about where to apply technology solutions to identified gaps and vulnerabilities.

Q2b. In FY05, how much funding has been provided to the DOE laboratories by non-S&T units of DHS? What role does S&T play is selecting the DOE laboratories to perform this work? What role does S&T play in overseeing the projects? Please provide examples.

A2b. As of mid-March, the Information Analysis and Infrastructure Protection (IAIP) Directorate indicates that approximately $73 million is projected to be allocated to DOE national laboratories in Fiscal Year 2005. The funding from IAIP is for vulnerability assessments and risk analysis from an operational perspective. IAIP is taking advantage of the knowledge base of the subject matter experts resident at the national labs. The Bureau of Customs and Border Protection estimates $96 million will be allocated to the DOE national laboratories. The Department's other Directorates select performers based on internal criteria suited to their specific mission requirements and user needs. The Office of National Laboratories within the Science and Technology Directorate facilitates other Directorates' access to the national laboratories as appropriate.

Q2c. The Homeland Security S&T Advisory Committee reviewed S&T's policy and existing interactions with the laboratories, and offered several recommendations going forward, including that DHS clarify its strategic needs from the laboratories, consolidate management and oversight of all DHS-funded work at the labs, and explore models for funding the labs that go beyond the current project-driven approach. What actions is DHS S&T taking in response to these recommendations?

A2c. The S&T Directorate values the Advisory Committee's recommendations and is actively developing a strategy to implement the Advisory Committee's concepts. We have commissioned a study by the Homeland Security Institute to develop specific criteria, metrics, and methods that we could use to address the Advisory Committee's recommendations. This study builds on the Homeland Security Institute's previous examination of the national laboratories' capabilities, and we expect the Institute to complete its study later this year.

Q3. The recent tsunami reminded us that it is critical for every community to have an effective means to communicate warnings or information for any natural or man-made disaster to the public. It is our understanding that DHS received $10 million in fiscal year 2004 (FY04) and another $10 million in FY05 to purchase National Oceanic and Atmospheric Administration (NOAA) Weather Radios to be placed in public schools across the Nation. Has any of the funding actually been used to purchase and deploy the radios? If not, why not? And how are you working with NOAA on this project?

A3. DHS is currently procuring NOAA All-Hazard radios for schools across the country. Following extensive coordination with NOAA, the Department of Education, and other DHS entities, a $500,000 pilot program was initiated to disseminate these radios to K–12 public schools in certain Urban Area Security Initiative (UASI) cities and two rural states. It is anticipated that these radios will arrive in schools before the end of this school year. After we consider lessons learned from the initial pilot program $1.5 million of additional alert and warning funds will be used, totaling $2 million for NOAA All-Hazard radio purchases. The remaining $18 million appropriated for alert and warning is being used for related efforts, such as applying satellite technology to emergency warning of natural or man-made disasters.

In addition to weather-related information, DHS and NOAA now have an agreement for NOAA's All-Hazard broadcasts to complement the Federal Emergency Management Agency's (FEMA) local Emergency Alert System. This allows NOAA All-Hazard radios to disseminate official DHS alert and warning information.

Q4. The Homeland Security Act of 2002 requires DHS to establish a Homeland Security Institute (HSI) to provide analytical services, including risk assessment and vulnerability modeling. A contractor for HSI was selected in April of last year. What is the funding level for HSI in FY04 and FY05 and the planned funding level in FY06? What tasks has it accomplished to date? How does S&T expect to use it going forward? Do other units of DHS have access to HSI's capabilities? How are those projects funded?

A4. The Homeland Security Institute (HSI), a Federally-Funded Research and Development Center (FFRDC), was established on April 26, 2004, to be a strategic analytic resource for DHS and provide the Department with the capabilities identi-

fied in Sec. 312 of the *Homeland Security Act of 2002.* The activities of the Institute are organized into core tasks (cross-cutting work to address strategic issues and broader, longer-term research needs) and analytic tasks that focus on specific issues or questions. Funding is provided to support both types of tasks consistent with the Institute's core capabilities.

In FY 2004, HSI received $9.0 million from the S&T Directorate for phase-in, core, and analytic tasks. For FY 2005, the S&T Directorate provided $15.5 million in core and analytic task funding. Other DHS components, including the Border and Transportation Security Directorate, the U.S. Coast Guard, and the DHS Chief Information Officer, have access to HSI's capabilities and have provided or committed approximately $1.5 million for analytic task funding in FY 2005. HSI funding for FY 2006 is in the planning stages and will be determined later as individual DHS elements identify their analytic needs. To date, the Institute completed all tasks assigned in the FY 2004 Research Plan, is underway on the 42 tasks identified for the FY 2005 Research Plan, and is developing (along with DHS) a set of research activities for possible FY 2006 funding.

The Homeland Security Institute's core capabilities include systems analysis, risk-consequence-vulnerability analyses, operational and capability assessments, multi-faceted threat evaluations, economic and policy analysis, alternative investment comparisons, and simulations. The Institute also sponsors and analyzes outputs from meetings and workshops on topics such as Wide Area Biological Restoration, Rail Security, and Cargo Security. These workshops bring together top experts from the public, industry and academia, along with the Federal/State/local government sectors, including the national laboratories, to address specific critical issues and develop broad-based priorities that can drive the DHS strategic decision processes. HSI has also been working with various standards committees to help foster the development and promote community-wide acceptance of homeland security related standards. HSI is also involved with charting and assessing homeland security capabilities at a variety of national laboratories. The Institute is currently funded to evaluate several operational systems including the assessment of urban bio-monitoring methods. These kinds of analyses provide an independent focus and evaluation process to the system assessments. HSI has also begun to work with other DHS components, including the Office for Domestic Preparedness, the Information Analysis and Infrastructure Protection Directorate and the Office of Program Analysis and Evaluation.

Q5. On page 22 of your testimony, you indicate that DHS is working on a "'Future Smart Container' initiative encompassing container security, communications, and data systems for the future." How much is DHS spending on this program in FY05? How much does it plan to spend in FY06? What are the priorities for container security research? Should we be focusing on near-term solutions or more long-range research?

A5. In support of the Maritime Security Policy National Security/Homeland Security Presidential Directive (NSPD–41/HSPD–13) and the *Maritime Transportation Security Act of 2002,* specifically the Container Security Initiative, the S&T Directorate is developing both short- and long-term enhancements to container security under the auspices of the Cargo Security Program.

During FY 2005 and FY 2006, the majority of our Cargo Security efforts are in container security. The planned container security investment is $10.6 million in FY 2005 and $12.0 million in FY 2006. We are also developing other aspects of cargo security including communications and data management systems.

The longer-term priorities for cargo security research are:

- Assuring the integrity of container loading and documentation;
- Reducing risk of undetected tampering in transit;
- Providing accurate, complete, timely, and protected shipment information; and
- Enhancing supply chain efficiency.

DHS is working towards a cargo security program that will utilize an integrated network system able to effectively and efficiently manage the large amounts of information that come with the use of various types of sensors and technologies.

Q6. The Electronic Crimes Task Forces (ECTFs) of the Secret Service have proven to be effective in stopping Information Age crimes such as identity theft, cyber terrorism and online fraud. Is DHS S&T working with the Secret Service and the ECTFs on a research agenda for these areas?

A6. The S&T Directorate is working with the U.S. Secret Service (USSS) to develop requirements for research, development, testing, and evaluation (RDT&E) to address identity theft, cyber crimes, online fraud, and similar issues. Responding to needs identified by internal customers within the USSS, the S&T Directorate's Cyber Security RDT&E portfolio funded a project to develop a software tool for identifying certain types of Internet communications commonly used for illicit commerce in with stolen credit card numbers and related data. In addition, in a recent proposal competition that included seven technical topic areas, one of the topic areas solicited proposals aimed at technologies to defend against identity theft. Several members of the USSS participated in the review process for these proposals, some of which concerned phishing (a form of cyber-based social engineering that uses misrepresentation to trick users into divulging sensitive or personal information which is then used for identity theft or other fraud). Three projects aimed at preventing phishing were identified as meriting funding.

Q7. The National Institute of Justice (NIJ) Center, co-located at the Air Force Research Laboratory Information Directorate at Rome, has had a tremendous record of leveraging technologies developed by the military and transferring these technologies to state and local law enforcement, particularly in the emerging area of cyber crime and cyber terrorism. What is DHS doing to work with the NIJ to assist State and local law enforcement with new and emerging technologies?

A7. The S&T Directorate's Office for Inter-operability and Compatibility (OIC) has partnered with NIJ on a number of initiatives, and their representatives serve together on a number of committees to help the local and State law enforcement community. Mutual efforts have included establishing an interagency Memorandum of Agreement to coordinate and collaborate on the development of a process to transfer technologies and equipment to emergency responder communities, creation of a Joint Evaluation and Testing (JET) Program for public safety equipment, and NIJ membership in OIC's SAFECOM Advisory Group. Through the SAFECOM Advisory Group, NIJ has participated in development of the Statewide Communications Inter-operability Planning (SCIP) Methodology, a strategic plan for statewide communications and inter-operability in Virginia, and a Public Safety Statement of Requirements for Communications and Inter-operability (SoR), among other efforts. State and local law enforcement also receive assistance with new and emerging technologies through the Information Analysis and Infrastructure Protection Directorate and the Office of State and Local Government Coordination and Preparedness. IAIP provides operational assistance for new technologies and OSLGCP supports equipment acquisition.

Q8. On page 32 of your statement, within the "Office of SAFETY Act Implementation (OSAI)" section, you note that: "The number of applications is expected to increase significantly with the introduction of the revised kit, implementation of the Final Rule, and higher visibility." Additionally, you note that: "OSAI plans to expand its coordination of the program with pending federal, State and local procurements." Given the expectation for an increased workload and expanded efforts, what is the justification for a 44 percent decrease in the OSAI budget? What activities will be cut? What is the personnel level for OSAI in FY05, and what is the proposed personnel level for FY06?

A8. The Office of SAFETY Act Implementation was established in 2004–2005. Nonrecurring costs for the OSAI from that time include those associated with the development of a multi-stage process for implementing the governing regulation; developing and refining the review and approval process and for training and certifying reviewers; securing a proper a facility and support staff to house the OSAI in a manner guaranteed to protect the sensitive proprietary information; establishing a network of technical reviewers; and establishing a web-based SAFETY Act application submission, review, and approval mechanism.

Based on initial assumptions about the prospective number of applications, the Department designed the program to have the capacity to process up to 1,000 applications per year. However, fewer applications than expected were received. We expect that more Federal, State and local government contracting officers and industry learn of its benefits and we fully implement measures to make the program more accessible, the number of applications will increase measurably.

Thus, although the proposed budget for FY 2006 has been reduced, no planned SAFETY Act activities will be cut since the infrastructure, application process, and vetted reviewers are now in place. The funding stream for FY 2005 and FY 2006 are sufficiently robust to accommodate significant increases in applications. We reiterate that it is our goal to integrate, to the maximum extent possible, SAFETY Act

protections with appropriate public procurements—federal, State, and local. As procurement officials at all levels become aware of the benefits of integrating SAFETY Act protections into public procurements, we anticipate an increase in the number of full applications.

In FY05 the staff at the Office of SAFETY Act Implementation included: the Director, a federal detailee, an IPA from academia, three SETA support contractors, and a core staff of 33 supplied by the prime contractor FFRDC. In addition, the OSAI has established, through a support arrangement with a DOD FFRDC, the capability to reach out to more than 400 technical reviewers that can serve on an as-needed basis as evaluators of SAFETY Act applications. This capacity allows the OSAI to ensure a strong technical and scientific basis for each SAFETY Act decisions and ample surge capability without maintaining an excessively large permanent staff. Since DHS has already paid the non-recurring start-up costs described in paragraph one and we have been able to realize labor savings through the use of consulting arrangements, we are comfortable in projecting a 44 percent overall decrease in operational cost.

Q9. On page 59 of your statement, within the "Office of SAFETY Act Implementation (OSAI)" section, you note that: "the S&T Directorate has created a partnership with federal procurement offices to introduce them to the program." Please indicate when this partnership was launched, list the federal procurement offices that are members of this partnership, and describe what this partnership has accomplished since its inception. Furthermore, please list the procurements that have been considered for SAFETY Act coverage, and those that have actually been given SAFETY Act coverage, as part of this partnership effort.

A9. The Department and the Office of SAFETY Act Implementation (OSAI) will continue to reach out proactively to inform relevant communities-first responders; State, local, and tribal agencies; the private sector; the legal profession; federal agencies; procurement and acquisitions officers-of the benefits and processes associated with the SAFETY Act. We realize that there is still a learning curve and that additional efficiencies are possible. However, our overall goal is for procurement officials at the federal, State, or local levels to identify the potential for SAFETY Act protections and contact the Office of SAFETY Act Implementation prior to the public solicitation. OSAI has established internal procedures to flag applications submitted in connection with federal, State, and local procurements and expedite their processing. The Department is also supporting on-going interagency efforts to asses the need for and potential development of modifications to the Federal Acquisition Regulation in light of the SAFETY Act and Executive Order 13286. The Department will continue to listen to these communities for ways to better implement the Act. OSAI has coordinated the timing of its review of SAFETY Act applications to accommodate procurements by the Transportation Security Administration, Customs and Border Patrol, and the New York Metropolitan Transportation Authority.

Q10. As the S&T Directorate operates, maintains and deploys the BioWatch program, please describe what, if any, liability risks you believe the government faces should this system fail to work and harm come to the public. Also, please describe what risk management systems are currently in place to mitigate this risk—i.e., do contractors, vendors, or suppliers to the program benefit from either indemnification or SAFETY Act coverage? If not, what is the rationale for this lack of coverage? Will technologies developed for the next generation of BioWatch equipment receive indemnification or SAFETY Act coverage?

A10. Government liability would be determined in accordance with the principle of sovereign immunity and its limited waiver in the *Federal Tort Claims Act.* However, the S&T Directorate believes it has an obligation to ensure that the overall BioWatch program works properly as a matter of public safety and public trust, regardless of liability.

The Department is not aware of any SAFETY Act application submitted in connection with the BioWatch program. All providers of anti-terrorism technology may apply for the protections afforded by the SAFETY Act. Participants in the BioWatch program are certainly eligible to apply.

Q11. What is the status of the new DHS partnership with the Air Force Research Laboratory (AFRL) in Rome, NY? What progress has been made toward expanding DHS–AFRL collaborations in specific areas since the agreement was signed last August? Also, please provide information on the objectives, timeline, budget, and other plans related to the new agreement as it moves forward.

A11. AFRL has been supporting the execution of some of the S&T Directorate's Cyber Security portfolio activities, serving as a funding agent for several of the port-

folio's programmatic activities. Though most of the funding goes out to external performers, AFRL collects agent fees that support AFRL activities. AFRL is serving as an agent for approximately $5.8 million of FY 2004 funds. The total funding level for FY 2005 is expected to be somewhat lower due to reductions in some of our program budgets. Additionally, approximately a dozen members of AFRL's technical staff served on the review panel for a broad agency announcement (BAA) recently released by the S&T Directorate.

Within the S&T Directorate, the SAFECOM Program is in the process of developing a Statement of Work for Technical Support related to the Program's efforts to research and develop communications and information inter-operability standards important to public safety readiness for day-to-day operations, including counter-terrorism readiness. The Statement of Work would leverage AFRL's expertise in information technology (particularly in inter-operability, connectivity, information sharing, and data fusion) to perform R&D related to project SAFECOM. The Statement of Work is still being developed and is expected to be submitted for review or approval within the Department in FY 2005. It is anticipated that the level of investment that will fund R&D at AFRL will be $2–$2.5 million, although funds have not yet been obligated.

Questions submitted by Representative Dave G. Reichert

Q1. Washington State is home to one of the Department of Energy's (DOE) premier science laboratories, the Pacific Northwest National Laboratory (PNNL) in Richland, WA. Although not in my district, the Lab supports a robust program for DHS, including your Science & Technology Directorate, that has important regional and national impacts. Indeed, as you know, PNNL has unmatched capabilities in detecting radiological materials.

The President's FY 2006 budget submission announces a new initiative within DHS called the Domestic Nuclear Defense Organization. Can you explain to the Committee how this new organization will fit into DHS's existing structure, and how it will affect ongoing research efforts such as the radiological detection work conducted at PNNL?

A1. The Domestic Nuclear Detection Office (DNDO) is a jointly-staffed, national office charged with developing a global nuclear detection architecture and with implementing the domestic portion of that system. The system will detect and report attempts to import or transport nuclear devices, fissile, or radiological material intended for illicit use. DNDO reports directly to the Secretary of DHS.

The Department of Energy provides staff to DNDO to coordinate work and ensure that the national laboratories, including PNNL, receive clear guidance and direction on efforts regarding the global nuclear detection architecture. The national laboratories have long been this nation's source of critical nuclear expertise. That expertise will continue to be vital in responding to the threat of nuclear and radiological attack.

Q2. The Volpentest HAMMER Training and Education Center in Richland, WA and Lockheed Martin will be conducting several demonstrations of combined computer-based simulation and hands-on training and exercises for emergency responders this year.

Q2a. Will you encourage appropriate representatives from DHS to observe these demonstrations and seriously consider supporting this combined training and exercise pilot project starting next year?

A2a. During the last year, I visited the Volpentest HAMMER Facility, and I will ensure that the S&T Directorate encourages representatives from DHS to observe these demonstrations. Information provided by these demonstrations could provide valuable insight to the RDT&E needed in the area of simulation-based training and exercise which is a major thrust for the S&T Directorate's Emergency Preparedness and Response (EP&R) RDT&E portfolio.

Q2b. Will DHS cooperate with DOE to develop a strategy and a cooperative agreement to ensure that HAMMER remains available to meet DHS's growing training needs for emergency responders; law enforcement, customs, border protection, and security personnel, along with serving as a test bed to deploy new field technologies?

A2b. We want to thank Representative Reichert for bringing these capabilities of the Volpentest HAMMER Facility to our attention and we will ensure we take them into consideration.

Questions submitted by Representative Bart Gordon

Q1. Dr. McQueary, with the knowledge that a cyber attack on our nation's government computers could have devastating consequences for financial networks and the economy and/or could result in the theft of classified documents and sensitive personal information, why is it that cyber security still suffers from a lack of coordination, poor communication and an inability to set priorities at DHS?

What is the rationale for the requested $1.3 million cut to cyber security?

A1. The National Cyber Security Division in the Information Analysis and Infrastructure Protection (IAIP) Directorate has the lead on cyber security issues. DHS is following the priorities set forth in the National Strategy to Secure Cyberspace. S&T Directorate staff meet regularly with internal stakeholders in the Department's National Cyber Security Division and the National Communications System to understand operational requirements better. At an interagency level, the S&T Directorate's Director of Cyber Security R&D co-chairs (with the Office of Science and Technology Policy) the Critical Information Infrastructure Protection Interagency Working Group (CIIP IWG) within the National Science and Technology Council. The CIIP IWG is working with numerous representatives from other federal departments and agencies to develop a coordinated interagency federal plan for cyber security R&D.

We believe that our investment balance among the various technical portfolios is appropriate. The allocation of funding resources to portfolios is based on a formal strategic planning process that takes into consideration risk (including threat, vulnerability, and consequence) and other strategic objectives. Cyber security R&D competes with other investments, and we believe its funding is appropriate. The Department has been highly supportive of the planning approach taken by the S&T Directorate and believes that this process results in technically sound and supportable decision making with regard to funding allocations.

Q2. The S&T Directorate proposes to spend $110 million on its efforts to deal with the threat to commercial aircraft posed by shoulder-fired anti-aircraft missiles, such as Stingers. The RAND Corporation earlier this year calculated that installing existing technology on the commercial air fleet would cost an estimated $11 billion and require a continuing annual maintenance investment of $2.1 billion. It also recommended proceeding with the Department's R&D effort.

Q2a. How does the Directorate's proposed program address the concern that the current technology involves annual operating costs ($2.1 billion) equal to almost half of the current annual spending ($4.4 billion) on ALL aspects of transportation security?

A2a. The DHS Counter–MANPADS program was established to determine the feasibility and economic viability of potential counter-measures systems on commercial aircraft including the key issue of reliability and how it impacts annual operating and support costs. The commercial airline industry is very sensitive to operating and support costs and advocates the lowest cost impact possible if a counter–MANPADS solution is implemented. The $2.1 billion annual operating cost identified by RAND in their report was derived from direct application of current military systems and therefore represents a high upper bound of the cost impact for the Counter–MANPADS solutions currently being developed and demonstrated for commercial adaptation. A number of promising advancements in operational and maintenance concepts could reduce the cost of operations. Some of these include reducing the requirements of Minimal Equipment List (MEL), utilizing commercial supply chain management and increasing the system's reliability. One of the primary thrusts of the DHS Counter–MANPADS program is to increase the reliability of these solutions to a minimum threshold of 3,000 hours, with an ultimate target of 4,500 hours. While these are challenging goals, if the objectives of the DHS Counter–MANPADS program are met, the annual operating costs would be significantly reduced.

Additionally, the RAND report based its annual operating cost estimate on equipping 6,800 total aircraft, which includes all U.S. airline passenger, and cargo wide-body, narrow-body, and regional jet aircraft. While a decision has not yet been made whether to equip even a portion of the fleet, equipping a more limited number of aircraft (e.g., wide-body passenger aircraft) would further reduce installation and annual operating costs compared with RAND's estimate.

We believe that the DHS System Program Office assumptions and resultant cost estimates will be a more accurate reflection of the current status of the program, and the potential annual operating costs are expected to be reported to Congress in the second quarter of FY 2006.

Q2b. The RAND report also recommends a "concurrent technology development effort on understanding damage mechanisms and the likelihood of catastrophic damage to airliners from an attack." Are efforts underway within your program to address these recommendations?

A2b. The S&T Directorate supports this report's recommendation to examine the damage mechanisms and likelihood of catastrophic damage to commercial aircraft. We believe this is important information to include in the decision process for deployment of countermeasures on commercial aircraft. The DHS Counter–MANPADS System Program Office is working closely with the Department of Defense (DOD), the Federal Aviation Administration (FAA), and the National Aeronautics and Space Administration (NASA) to establish coordinated efforts to assess the vulnerability of large commercial aircraft and their associated infrastructure and to develop capabilities to mitigate the vulnerabilities identified. These efforts will include demonstration of new technologies that will reduce the likelihood of catastrophic damage regardless of threat type. The Counter–MANPADS program is designed to advance a countermeasures design to protect commercial aircraft from shoulder-launched missiles; this program is not intended to be a comprehensive technology development effort to understand and mitigate damage mechanisms.

The specific charter of the DHS Counter–MANPADS program is to advance a countermeasures design that will protect commercial aircraft from shoulder-launched missiles. However, we understand that the types of information recommended in the RAND report are important for inclusion in the decision-making process for deployment of countermeasures on commercial aircraft. The DHS Counter–MANPADS System Program Office is working closely with the Department of Defense (DOD), the Federal Aviation Administration (FAA), and the National Aeronautics and Space Administration (NASA) to establish coordinated efforts to assess the vulnerability of large commercial aircraft and their associated infrastructure and to develop capabilities to mitigate the vulnerabilities identified. These efforts will include demonstration of new technologies that will reduce the likelihood of catastrophic damage regardless of threat type.

Q2c. How significant is the false-alarm rate for current technology?

A2c. The false alarm rate of current sensor technology is an important consideration and its reduction is a primary objective of the current DHS Counter–MANPADS Program. The false alarm rate is far more critical for expendable-based systems because of the potential impact of dispensing expendable flares in a civilian environment and for the prevention of depleting the flares unnecessarily. The consequences of firing a laser (e.g., Directed InfraRed Countermeasure (DIRCM) systems) in response to a false alarm are less than a launched flare, but are not without potential impacts. One is the possibility of exposure of maintenance personnel to laser energy while the aircraft is on the ground. This can be prevented with safety interlocks and control logic designed for the civilian environment. Another is transmitting an Emergency Ground Notification (EGN) when a missile warning has been issued. Methods of managing an EGN during false alarms are being explored in Phase Two of the Counter–MANPADS program and will be integrated and tested during Phase Three.

Perhaps of more concern than the false alarm rate of the sensors is the false notification rate of system reporting. An Emergency Ground Notification report by the system could potentially trigger a number of national, State, and local responses to a potential MANPADS event. DHS has established a requirement that Counter–MANPADS systems must have a false notification rate of fewer than one in one million flights (current DHS threshold). Both of the DHS Counter–MANPADS Program contractor teams are implementing a number of processes and algorithms that will filter out sensor false alarms and result in system designs that will meet or exceed the DHS requirement. Future technologies currently in development with DOD may be candidates for insertion to reduce false alarms further.

Q2d. Are there ground-based detection and interception technologies that could be put in place, given that attacks are likely to occur in the vicinity of airports?

A2d. When the Directorate released its initial Counter–MANPADS Program solicitation in October 2003 it was open to all potential solutions, whether ground-based or aircraft-based. No company proposed a sufficiently mature ground-based solution. There are a number of ground-based technologies that are presently under development within DOD but none have been fielded or tested for use in a civilian environment. The Directorate is working closely with DOD to monitor progress in this area. Once DOD has matured ground-based technology to meet its own military oper-

ational requirements, the Directorate will investigate the applicability of this technology in a civilian environment.

Q2e. What assistance are you providing to help with securing the perimeters of airports, keeping these weapons out of range of commercial aircraft?

A2e. The Transportation Security Administration (TSA) has the lead within DHS for airport security. TSA is working closely with the FBI, local law enforcement, and the respective airport authorities to assess and mitigate the vulnerability of commercial airports to MANPADS and other standoff weapons attacks. TSA has performed numerous airport vulnerability assessments in and around airports to identify potential MANPADS launch areas. During FY 2005, TSA has completed 18 MANPADS Vulnerability Assessments, with an additional 14 scheduled. TSA has also developed local MANPADS mitigation plans that include the emergency response activities of all affected federal, State, and local agencies. TSA conducts MANPADS exercises and outreach efforts to validate mitigation plans and enhance situational awareness and education for local law enforcement agencies that help protect airports against this threat.

The S&T Directorate is currently charged with researching, developing, testing, and evaluating commercial aircraft anti-missile technologies. The Directorate is working with TSA, FAA, and law enforcement to establish the reporting requirements of the Counter–MANPADS System so that the system will support and integrate within the existing and future security architecture of the Nation's airports and the National Airspace System. The S&T Directorate and TSA coordinate on overlapping issues and areas of concern where they apply to improving civil aviation security.

Q2f. The RAND report recommended postponing installation of the current generation of these technologies. Do you agree with that conclusion?

A2f. The findings of the RAND Report are largely consistent with the reasons Congress established the DHS Counter–MANPADS program. The S&T Directorate's Counter–MANPADS Program is focused on migrating proven DOD technologies to the commercial aviation environment. Efforts to transition this military equipment to civilian use face several technical and programmatic challenges ranging from affordability and flight safety to aircraft structural impacts across a wide variety of equipment employed by the airline industry.

The decision to install any Counter–MANPADS system in the commercial aircraft environment will ultimately depend on balancing risks with cost and performance. In order to assess performance, the Directorate has proposed to maintain the progress of the current Counter–MANPADS efforts and recommends providing the requested funding for FY 2006. This investment would allow building and fielding a limited number of additional prototypes, conducting live fire testing, improving system reliability and annual operating cost, and continuing to mature and adapt the technology for commercial application.

Q3. The Directorate intends to expand the BioWatch program. It currently operates in some 30 metropolitan areas, according to the budget submission. How many additional regions will be covered, and how will they be selected?

A3. The current plan will expand coverage in the top threat cities rather than increase the number of cities covered. This decision was based on stakeholder requests for increased temporal and spatial coverage both indoors and outdoors in high threat areas, including transit facilities. In FY 2004, this architecture was deployed in pilot form to New York City. The expanded system will be deployed in FY 2005 and FY 2006 and will include additional collectors and an enhanced laboratory capability to accommodate the resulting increases in sample load. Future generations of BioWatch detection technology may reduce both the installation and maintenance costs, facilitating a wider coverage area.

Q4. The newest Scientific American *has an article titled, "If Smallpox Strikes Portland." The authors describe a computer simulation that looks at the spread of a biological agent through a city to study the most effective responses by public health authorities. They conclude that ". . .time was by far the most important factor in limiting deaths. . .. The actual response strategy chosen made little difference compared with the time element." How does the BioWatch program contribute to minimizing the time between detection of a threat and decisions by public health authorities on the most effective response?*

A4. Prior to BioWatch, health authorities relied on traditional epidemiological tools—primarily dependent on clinical signs of illness—to make public health response decisions. BioWatch offers a new early detection capability that can alert

public health authorities to a biological terrorist attack before exposed people show clinical signs of illness. This allows public health authorities time to give an exposed population post-event prophylaxis before the onset of disease, thus increasing survival rates. Current RDT&E efforts are underway to develop sensors that significantly reduce the time between the release of an agent and its detection. These improvements will further reduce the consequences of a bioterrorism attack.

Q5. The Biological Countermeasures program, of which BioWatch is a component, is one of the elements at DHS that was subjected to a Program Assessment Rating Tool (PART) evaluation. The PART analysis notes that ". . .during the initial execution of new programs and development of financial processes, there have been delays in FY04 execution. The Biological Countermeasures program inherited a variety of distinct funds in the FY03 transition coupled with carryover into FY04." What progress has been made in dealing with these transition events?

Q5a. The Standards portfolio also received a PART evaluation in this budget cycle, earning only an "adequate" rating. This translated directly into a $3 million decrease in the portfolio's budget request. Yet from your testimony the portfolio seems to be as active and successful as other Directorate elements. What represents the distinction between an "effective" and "adequate" program?

Q5b. The Standards portfolio's PART analysis shows the weakness in the portfolio to be the lack of independent evaluation of the program's success. Yet it states that this occurred because there hasn't been an independent evaluation of the portfolio because it's too new. Isn't this a bit punitive, even for the Office of Management and Budget?

A5a,b. The Biological Countermeasures Portfolio provided transition information for FY 2003 and FY 2004 in support of the PART evaluation. While the program is still implementing a number of activities funded in FY 2003 and FY 2004, the pace of expenditures is increasing steadily.

PART evaluation scores are translated into qualitative ratings as described below:

Rating Range: Numerical Scores from 0–100

Effective: 85–100

Moderately Effective: 70–84

Adequate: 50–69

Ineffective: 0–49

The focus of the PART program is to encourage continued evaluation and improvement. The PART evaluation for the Standards Program identified specific areas to focus on for improvement. The S&T Directorate is addressing these identified areas for improvement and expects the next PART evaluation to improve. It should be noted that the PART score strongly emphasizes demonstrated progress on annual and long-term performance measures. Newer programs that lack such will have somewhat lower PART scores until they develop a track record of performance.

The funding change for the Standards Program was not a result of the PART evaluation. Multiple factors are considered in identifying the recommended funding including risk, needs, and the prioritization of the total S&T Directorate's efforts.

The PART evaluation is not intended to be punitive; it is intended to identify specific areas to focus on to achieve program improvement. The Standards Program did not have evaluations in place at the time of the PART evaluation; thus, the statement that the program did not have independent evaluations of its program is a correct statement. However, the PART evaluation also noted that the reason the Standards Program did not have independent evaluations in place was the fact it was a new program.

Q6. The S&T Directorate will be conducting R&D on advanced detectors for chemical and nuclear materials. What improvements over current detector technology are expected to result from this program?

A6. The S&T Directorate is currently engaged in a wide variety of programs to provide additional capabilities for nuclear detection. The scope of these efforts spans from near-term product improvements that address immediate operational needs, to the development of next-generation capabilities, to foundational science to enable the development of entirely new detection capabilities. Improvements expected from the overall nuclear detection R&D program include increased detector sensitivities, decreased scan times for higher detector through-put, ruggedization of equipment for unique operational deployments, decreased overall cost of ownership, and reduced labor required to operate the equipment.

For chemical detection, the S&T Directorate is focusing its efforts on improving both detection performance and operational utility for detect-to-warn and emergency responder applications. Current chemical sensors tend to give false positive readings in real-world use, are unable to detect low vapor pressure chemicals, and require multiple detection systems to cover a broad range of potential chemical threats. The S&T Directorate's RDT&E efforts are focused on developing sensors with broader range (including low vapor threat agents) and lower false positive rates that can be integrated into a single detector. We have ongoing projects both to develop near-term solutions for detect-to-warn capabilities and for emergency responders and to provide more optimal solutions over the longer term.

Q7. This committee has long been concerned about the balance between short- and long-term research and the tendency of agencies to focus resources on development at the expense of research. Your testimony notes that basic research is earning a higher percentage of the Directorate's proposed budget for FY 2006, but that is after it slipped backwards between FY 2004 and FY 2005.

Q7a. What criteria do you use to evaluate whether the Directorate is devoting adequate resources to basic research?

A7a. The S&T Directorate has a formal risk-based strategic planning process (including threat, vulnerability, and consequence) that identifies critical areas of need for RDT&E. This process identifies both short- and long-term research needs that are required to meet our strategic objectives in support of securing the homeland.

The S&T Directorate evaluates whether it is devoting adequate resources to basic research first by taking into account opportunities to leverage basic research conducted by others to maximize efficiency. The S&T Directorate then identifies the gaps in basic research that appear to be most relevant to the homeland security mission and assesses whether our applied and developmental efforts have sufficient basic information to facilitate RDT&E to secure the homeland. Because basic research programs typically have a longer timeline than applied and developmental programs, it is essential that the S&T Directorate always has a stable basic research program in areas relevant to the Department's and the S&T Directorate's strategic objectives.

Q7b. How does the Directorate's priority-setting process deal with the tension between short- and long-term needs when making investment decisions?

A7b. The S&T Directorate's strategic planning process uses a risk-based approach (including threats, vulnerabilities, and consequences) that identifies critical areas of need for RDT&E. The potential impact of RDT&E investments is evaluated and those efforts, both short- and long-term, that will have the greatest impact on reducing risk are pursued.

In the two years that this Department has been in existence, the Science and Technology Directorate has focused its efforts on near-term development and deployment of technologies to improve our nation's ability to detect and respond to potential terrorist acts. However, we recognize that a sustained effort to continually add to our knowledge base and our resource base is necessary for future developments. Thus, we have invested a portion of our resources, including our university programs, toward these objectives. The following table indicates our expenditures in basic research, applied research, and development to date.

Science and Technology Directorate Investments in R&D Conduct (in millions of $)			
Fiscal Year	**FY 2004(actual)**	**FY 2005(estimated)**	**FY 2006(proposed)**
Basic	68	85	112
Applied	243	340	399
Developmental	470	587	746
Total	**781**	**1012**	**1257**
% Basic	**8.7%**	**8.4%**	**8.9%**

Our expenditures in basic research are heavily weighted by our investments in university programs. These university programs will not only provide new information relevant to homeland security, but will also provide a workforce of people who are cognizant of the needs of homeland security, especially in areas of risk analysis, animal-related agro-terrorism, bioforensics, cyber security, disaster modeling, and psychological and behavioral analysis.

Q7c. What is the likely trend in the Directorate's support for basic research over the next decade?

A7c. In FY 2004 and FY 2005, as well as the budget request for FY 2006, the allocation for basic research has been maintained at approximately 8½ percent of the total S&T Directorate's RDT&E budget. We plan to increase the allocation for basic research to over 10 percent in future years.

Q8. One of the Department's first University Centers of Excellence, the Center for Risk and Economic Analysis of Terrorism Events at the University of Southern California, is receiving $12 million over three years "to evaluate the risks, costs and consequences of terrorism and to guide economically viable investments in countermeasures," according to your testimony. It would seem that their work would be invaluable to you in setting priorities for the Directorate and evaluating the requests for support you receive from the Department or other agencies. What results have you received to date from our investment in this Center, and how are they contributing to the work of the Directorate's Office of Plans, Programs and Budget?

A8. The University of Southern California Homeland Security Center for Risk and Economic Analysis of Terrorism Events has been in existence for just one year. A number of significant studies and analyses are well underway at the Center.

The Center and its consortium partners are developing modeling capabilities that cut across general threats and targets, represented by application areas such as electrical power, transportation and telecommunications. The Homeland Security Center is also developing tools for planning responses to emergencies in order to minimize the threat to human lives and reduce the economic impact in the event of an attack. The HS Center works closely with DHS to prioritize key research areas, and it also provides relevant educational programs. The grant allows the HS Center to pursue research and development and educational programs in accordance with DHS priorities. This will provide the Department with peer-reviewed, scientifically validated assessments and models and independent technical expert advice.

Q9. You state in your testimony that "[a]bout 60 percent of the Science and Technology Directorate's appropriation in FY 2005 will be executed directly through the private sector, with HSARPA managing about 40 percent of that." This committee has jurisdiction over another agency that executes much of its mission through the private sector. The National Aeronautics and Space Administration (NASA) has been prominent on the Government Accountability Office high-risk list for contract management problems for more than a decade. How does the Directorate plan to maintain the cadre of qualified program managers it will

need to assure that its R&D efforts do not end up sharing NASA's problems in this area?

A9. The S&T Directorate recognizes the need for acquiring and maintaining a cadre of qualified program managers. The S&T Directorate's current program managers are senior staff with demonstrated program management effectiveness, not only in their work to date with the S&T Directorate, but also in their prior service in other government agencies, private industry, and academia. The S&T Directorate continues to recruit highly-qualified program managers and to support the continued development of current program managers through training. In addition, the S&T Directorate conducts program reviews to ensure that expected results are being achieved. Any deficiencies in program progress will be identified and addressed, including any deficiencies that would be attributable to program management. The S&T Directorate continues to place high emphasis on its program management responsibilities, including acquiring and maintaining qualified program managers.

Appendix 2:

Additional Material for the Record

INSERT FOR THE RECORD FROM DR. SAMUEL W. BODMAN IN RESPONSE TO REPRESENTATIVE JERRY F. COSTELLO

The following information for the record was submitted by Dr. Samuel W. Bodman, in response to a question asked by Representative Jerry F. Costello (see page 123).

The competitive solicitation for site selection will be issued approximately three months after the FutureGen cooperative agreement with our industry partners is signed. We anticipate that site selection will be completed within 18 to 24 months after the signing of the cooperative agreement. The site selection will be a fair and open competitive process that would evaluate each of the proposed sites on its merits against a set of technical and environmental (National Environmental Policy Act—NEPA) criteria.